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THE SURGICAL CLINICS OF NORTH AMERICA

VOLUME 1

NUMBER 4

CLINIC OF DR. ARTHUR DEAN BEVAN

PRESBYTERIAN HOSPITAL

X-RAY BURNS

Summary Presentation of 2 patients with x-ray burns of the leg, one following treatment for psoriasis and the other for eczema. Treatment of burn by removal of damaged tissue and skin-grafting. Results very gratifying following this method.

ONE of the most important of the unusual problems that have presented themselves in the last twenty five years since the discovery by Roentgen of the x-ray has been the subject of x ray burns. Fortunately I am able to show you 2 of these cases this morning. I shall operate upon one the other I operated upon several weeks ago and I can present the case to you and give you the history and show you the result.

A few months after Roentgen's announcement of the discovery of the x-ray one of my friends here in Chicago Dr Otto L. Schmidt, developed at a good deal of expense an x-ray laboratory and placed it in charge of Mr Fuchs. Dr Schmidt deserves a great deal of credit for doing some of the pioneer work in this country with the x-ray and enabling us here in Chicago to familiarize ourselves very early with the use of the x-ray both as a means of diagnosis and as a means of treatment. In fact, Chicago was at the beginning the hot bed in which much of the early x-ray work in America was done. For instance, we did here the first work in the use of this agent as a means of diagnosis in kidney stone. Dr William Alfred Pusey of Chicago, and one of my associates, Dr Joseph F. Smith now of Wauwatosa, Wisconsin, did some of the earliest work with the x-ray.

means of treatment in lupus vulgaris and, as you all know Dr. Pursey and Dr. James Nevins Hyde and his associates, Dr. Montgomery and Dr. Oliver S. Ormsby have done pioneer work and exceptionally good work in the use of the x-ray in epithelioma and in skin lesions. Dr. Nicholas Senn was one of the earliest men to use the x-ray in leukemia and in Hodgkin's disease.

Immediately following the introduction of x-ray work it was first noted that it would produce a falling out of the hair of the beard or scalp. Very shortly afterward serious burns from the use of the x-ray began to be reported. Within the first few weeks of the use of the x-ray in Dr. Schmidt's laboratory several serious burns were produced some of which led to malpractice suits, and were tried out in court. It was unfortunate that in some of these cases, in spite of the good intentions of the men using the x-ray and their lack of knowledge of its destructive effects, juries returned verdicts for the plaintiffs in these law suits. Of course, the early use of the x-ray was rather crude and we were ignorant of many of the facts which are now clearly understood. We are at present in a position where we can speak with considerable knowledge in regard to the destructive effects of the x-rays and in regard to the serious consequence of x-ray dermatitis with resulting carcinoma and x-ray burns with greater or less destruction of tissue. Mr. Fuchs, who began the work in Dr. Schmidt's laboratory developed very early a dermatitis, and later as did many of these x-ray operators, died of carcinoma.

To many of you this may seem an old story and yet some of the younger men who did not live through this period do not realize the risks that these early x-ray technicians ran. I do not think it an exaggeration to say that most of the early x-ray technicians died of carcinoma developing in x-ray dermatitis lesions of their hands. The experts of today realize these dangers and protect themselves against dermatitis and against producing x-ray burns in their patients in large part, although I still occasionally see an x-ray burn that has occurred in the hands of an expert. Unfortunately many of the men using x-ray machines today are not experts and are not familiar with the risks and

dangers, and x ray burns are therefore still common and occur largely in the hands of these men.

In the case we shall operate on this morning a young man of twenty five was treated for psoriasis of the leg with the x ray and unfortunately received very massive treatment, which resulted in producing an x-ray burn about 5 or 6 inches long and about 3 inches wide, over the anterior surface of the leg about midway between the knee and the ankle. At first it seemed as though this was not very deep and it finally under careful treatment, very slowly healed up leaving an area of low vitality but which finally entirely covered over with thin epidermis and scar tissue. A couple of months ago he bruised this scar and it broke down became quite painful and gradually extended into a large slough about 4 or 5 inches long and 3 inches wide. This case came into the hands of a colleague of mine and some weeks ago he brought him to my service. I advised operation dissecting out of the tissue that had been damaged by the burn, and skin-grafting of the area. The man had pain in the burn, as most of these patients have. In his particular case the pain was not as severe as usual but for several weeks he has been taking small doses of morphin to control the pain. He has lost weight and strength, and he is very nervous and mentally depressed because of his condition.

We shall do this operation under a general anesthetic and select ether for that purpose. The left thigh has been prepared so that we can take the skin-grafts from the same limb as the burn, which I think, as a rule is a good thing, leaving one limb perfectly free from bandages or dressings. This gives the patient, I think as a rule more comfort than to put both limbs out of function by the operation. You will notice that there is a thick scab covering this area, a dark brown and dry scab. Underneath this is some pus. I begin my dissection going very wide of the damaged skin, at least $\frac{1}{2}$ inch outside of the destroyed skin. I think it is the safer plan to do this because my experience has been that if I make the dissection too close to the damaged area we may leave some tissue which is not grossly involved, but which heals very slowly. As I raise up this dis-

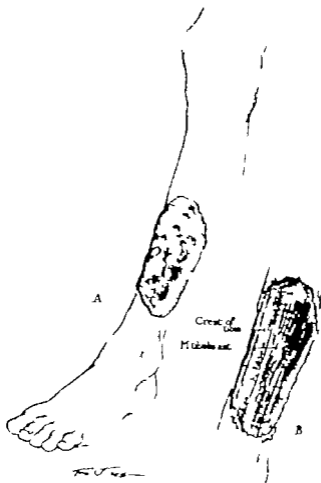


Fig 390—A, Ray burn of leg. A large gangrenous area is seen as he elevated by bed of pos. B, After excision of an live necrotic area, of exposure of tendons and the anterior surface of tibia.

section you will notice that the scab and the destroyed area go down very deeply involving not only the skin but the superficial fascia and the deep fascia and a thin layer of muscles on the anterior layer of the leg. I dissect this up very carefully and finally remove in one block of tissue all of the damaged structures. From some standpoints it would be better to cover this large area with a flap of the entire thickness of the skin and superficial fascia, making a pedicled flap taking it from the other limb. I have found, however, that covering these areas with good Thiersch grafts as a rule gives excellent results, and is, on the whole, very much simpler and more satisfactory. My dissection now leaves an area about 7 inches long and 4 inches wide. You will notice that we have exposed not only the anterior group of muscles of the leg but that the destruction also involved the periosteum on the anterior surface of the tibia which comes out with this large eschar we have removed. I also uncovered the peronei muscles on the outer side of the leg in the dissection.

Beginning now with our skin-grafting I split the thickness of the skin of the thigh by a sawing motion with a very sharp razor ground perfectly flat on one side. The first ribbon, as you see, is about 2 inches wide and about 4 inches long. This is accurately placed on the exposed area of the anterior group of muscles and one after the other. As you see, it is necessary for me to cut five good-sized ribbons of half the thickness of the skin in order to close the area completely. I now cover these skin-grafts with one thickness of gauze very carefully applied. I can see through it as one can see through a veil, and see that I have brought the gauze flatly and smoothly against the skin-grafts and keep them very accurately in contact with the raw surface. Over this I now place several thicknesses of sterile gauze and over this a sterile gauze roller about 5 inches in width. Over this again I put on a starch bandage covering the entire dressing and allow the starch to dry and to fix the dressing accurately in position. This dressing will be left on for four or five days if there is no reaction, and then very carefully removed, so as not to lift the grafts up from their bed.

I shall now show you the second patient upon whom we operated about three weeks ago and give you the history of this case and use this other patient as a means of describing fully the after-management in these cases and the after history.

This patient, a lady of seventy a patient of Dr. Ormsby was treated with the x-ray for eczema of the leg and, unfortunately in someone's hands, not Dr. Ormsby's, received a very severe burn about 5 inches long and about 2½ inches wide on the *anterior surface of the leg in about the same position as this patient*. She has kindly consented to allow me to show you this case. This patient has been bedridden for a great many months on account of this burn, principally on account of the severe pain which she has been experiencing. I want to discuss the pain of an x-ray burn with you because it is one of the most important features. The pain of an x-ray burn seems to me to be *very much like the pain in senile gangrene due to obliteration of the blood-vessels and starving of the nerves of their normal supply*. The pathology of the two processes is fundamentally the same because in an x-ray burn the essential thing is the gradual obliteration of the blood vessels, and where necrosis occurs it is due to the fact that obliteration of the blood-vessels is so complete as to no longer supply the necessary amount of blood to the part. The pain of an x-ray burn is, as a rule, very severe and sometimes excruciating. In many of the cases the patients become users of morphin driven to it by the severe pain. In several cases where we have had x-ray burns about the anus, produced in the efforts to cure pruritus ani, the pain has been agonizing, especially when the patient had a bowel movement, and at this time sometimes requiring 1 grain or 2 grains of morphin to control the pain and to permit of a bowel movement. There is one very characteristic thing about this condition and that is, as soon as we dissect out completely the tissue damaged by the x-ray the pain almost at once disappears. I have had many patients make that statement to me, and that is confirmed also by the striking fact that many of these patients who have been taking considerable amounts of morphin are

quite willing to very soon discontinue completely the use of the narcotic.

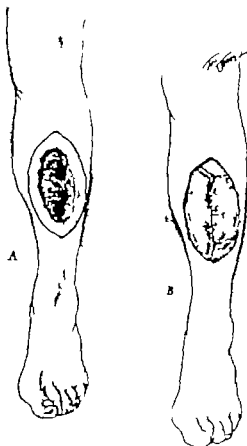


Fig 391 — Ray burn of leg. Not side excision of entire area and the application of large Thiersch grafts.

In this lady's case we did the operation under ether and in exactly the same way as you have witnessed this morning. The immediate effect was the relief from pain, and in spite of the fact

that she was in an extremely nervous condition owing to her long confinement (she had been in bed more than four months on account of the burn) she expressed herself as being most grateful for the relief from the pain that the operation had afforded. At the end of a week I made the first dressing and found that all of the grafts had taken. Now you will see at the end of three weeks the entire area is perfectly healed, there still being simply at the margins narrow scabs covering the junction of the grafts and the line of the incision, and also two narrow scabs running up and down the area marking the position of the junction of the two skin-grafts.

This patient had not walked for more than four months, and on account of the pain had kept the right limb the damaged limb perfectly quiet during that time and obtained a very marked fibrous ankylosis of the knee as a result. It was with difficulty that I could encourage her to bend the limb and to attempt to use it in walking but she is now able to move the limb and able to walk with the assistance of a nurse, gradually recovering her strength and weight, and within a short time will be able to leave the hospital.

Nothing is more gratifying than a case such as this where we can relieve the patient of a serious condition such as an x ray burn by completely removing the damaged area, and are able to cover the raw surface from which the destroyed tissue is removed with normal skin and obtain good, complete wound healing, with resulting freedom from pain and return of function. I think, as a rule, where the x-ray burn is serious you will save a great deal of time instead of handling the case, as is frequently done for months with various dressings and salves, if you will as soon as you recognize the fact that a certain portion of the skin is so much damaged that it cannot repair itself take radical steps and remove the damaged tissue and cover the area by skin-grafts.

We have, fortunately or unfortunately on our service handled probably from 25 to 30 of these x ray burns in series of years. In a few cases we have seen carcinoma develop in the damaged area. I am inclined to think, however from my knowledge of

the subject and from my own personal experience that epithelioma is not as apt to develop in tissue that is so greatly damaged by the x ray that it completely loses its vitality as it is in the minor lesions which are classified as x ray dermatitis. In a large series of x-ray burns I can remember but 3 epitheliomas that have developed in these lesions. On the other hand the cases of x-ray dermatitis which I have seen in the hands of x-ray technicians have in the majority of cases ultimately resulted in carcinoma.

Do not these cases preach a sermon? Must it not be perfectly clear to every one that the x ray should not be used by untrained hands, and that it is a very powerful agent that may do much good or may do much harm? Burns may occur even in the hands of the greatest expert. When we refer a patient to an x ray laboratory for x-ray treatment we should feel confident that the x ray treatment will be given by some one who realizes the dangers, and who is sufficiently well trained to reduce the chances of burning the patient to a minimum and to a very small fraction. I think this is the first lesson taught in this sermon, and the second is that to cure these patients we should very early resort to the removal of the damaged tissue and to skin-grafting both for the purpose of curing the patient of his immediate disability and of making as remote as possible the development of a resulting epithelioma.

TWO CASES OPERATED ON UNDER LOCAL ANESTHESIA —ONE AN ACUTE APPENDICITIS AND THE OTHER A CARCINOMA OF THE PYLORIC END OF THE STOMACH

Summary Case I—Acute appendicitis in man of eighty suffering from sarcoma of the sternum. Advantage of local anesthesia in case of this kind.

Case II—Carcinoma of the pyloric end of the stomach in man of seventy-eight. Anterior gastro-enterostomy—technic employed. After history

I DESIRE to present to you this morning 2 cases of unusual interest. The patients are both old men one eighty and one seventy-eight, requiring surgical treatment, and they are both so handicapped because of their age and organic disease that a general anesthetic, either ether or gas and oxygen, seems distinctly contraindicated and on that account I shall attempt to do both of these operations under local anesthesia.

The first patient is a man of eighty who has been in the Presbyterian Hospital under the care of Dr B W Sippy and my associate, Dr D B Phemister. He has been here for several weeks suffering from what is apparently a sarcoma beginning in the upper end of the sternum especially the left side of the sternum. A section of the tissue has not been obtained but the physical examination and careful x-ray examination of the chest seem to exclude a diagnosis of aneurysm or of any other lesion except that of primary sarcoma of the sternum. The patient has a very bad heart. Outside of the heart trouble and sarcoma of the sternum his general condition is good for a man of his age. Last night he was suddenly seized with a very acute pain in the abdomen. This was at first general but finally has localized about the appendix. He has become quite distended and the abdominal muscles are very tense, distinctly more marked upon the right side than upon the left. The urine is normal. The leukocyte count is 16,000. His pulse and temperature are practically normal.

Dr Sippy and I studied the case with a good deal of care, and because of the findings and by excluding other possible lesions that might give a similar picture we have arrived at a clinical diagnosis of appendicitis. The case is so acute and the abdomen is so tense, with beginning tympany that we do not feel warranted in allowing him to go on without the benefit of an exploratory operation. Because of his heart condition I agreed to do the operation under local anesthesia. I have explained this to the patient, and he is quite willing to have the operation and have it done under a local anesthetic.

The patient has been prepared and, as you will notice, the abdomen is very much distended, very rigid, and exquisitely tender over the right lower quadrant (Fig. 392). I begin by infiltrating the line of the usual appendix incision with a solution of $\frac{1}{2}$ of 1 per cent. novocain with 1 : 100,000 adrenalin. I use, as you see, a very fine needle for the first injection, and then infiltrate the skin for a distance of about 6 or 7 inches in length, then the superficial fascia, and then, introducing the needle a little deeper I feel that I have passed it into the layers of the abdominal muscle. One cannot distinguish distinctly between the needle passing through the internal oblique and transversalis, but one can feel quite distinctly that the needle does pass into the external oblique. I now make a long incision, about 6 inches in length, through the skin and superficial fascia, and then infiltrate the external oblique with two or three syringefuls of the solution. I now divide the external oblique and retract the edges of the incision widely, expose the internal oblique, and infiltrate this in the same way. This part of the operation is quite painless. You will notice that I have used the novocain solution very freely and have already used about 3 ounces of it. Taking two dissecting forceps without teeth and with blunt dissection, I separate the line of the fibers of the internal oblique and transversalis and expose the peritoneum. I retract the internal oblique and transversalis and the edges of the external oblique with four retractors, two in the hands of each assistant, exposing the peritoneum for an area of about 2 $\frac{1}{2}$ inches in diameter. I then very carefully infiltrate the peri-

toneum. I do this because the parietal peritoneum is very sensitive. I then divide the peritoneum making an opening about 2½ inches in length. The ascending colon at once comes into view and I draw this out gently with two pairs of dissecting

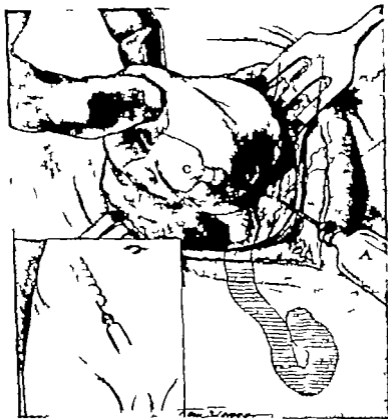


Fig 392—Acute appendicitis. Insert shows method of infiltration. Note injection of mesentery of appendix (A B C D) before removal from abdomen. Appendix shown by shaded area.

forceps without teeth, and with a syringe of novocain solution I infiltrate the mesentery at the ileocecal junction. In spite of the fact that I have drawn the bowel out very gently this has given the patient some pain, especially when I make an effort

to draw the appendix into view. Following down the ascending colon toward the cecum I now pull the cecum into view but find that I cannot bring the appendix out of the abdomen on account of adhesions. I use another syringe-ful of the novocain solution and inject the mesentery about the appendix. With artery forceps on the appendix, first at its base and then applying the forceps about $\frac{1}{2}$ inch further down and then another $\frac{1}{2}$ inch until I reach the end, I finally draw the appendix out of the abdomen. At the same time I do this I very gently separate with my gloved finger the adhesions which surround it. I now have the appendix entirely free, and you see it is curled up on itself. It is about $3\frac{1}{2}$ inches long. The last inch is curled up on itself and is gangrenous. Fortunately it has not perforated and there is no free pus in the peritoneal cavity. The patient had, as you could see, during the few moments that I was bringing the appendix out from its surrounding adhesions considerable pain, but now that the appendix is free the pain has disappeared entirely and we can without any distress whatever complete the operation.

I first ligate the mesentery with catgut and then crush the appendix with heavy forceps about $\frac{1}{2}$ inch from the cecum, ligate it at its crushed point with black silk suture and cut off the portion of it beyond the ligature. I touch the stump with half a drop of carbolic acid, which is then carefully wiped off and invaginate the appendix with first a linen purse-string suture and over this a suture of fine catgut. I then close the abdominal wound of the muscle-splitting incision with very fine catgut for the peritoneum, silkworm-gut for the internal oblique and transversalis and external oblique using two silkworm-gut sutures through the skin, superficial fascia and external oblique so as to obliterate the dead space in this abdominal wall which would be quite large because of the depth of his superficial fat, which is, as you see about $1\frac{1}{2}$ inches in thickness. I leave in a small split rubber tube which, however I expect to remove within forty-eight hours.

I am glad of the opportunity of showing you this case because it demonstrates, first, the use of local anesthesia in cases of this kind. If it were not for his heart condition I should ha

given him a few whiffs of nitrous oxid gas for the few moments of the operation in which I was separating the appendix from its adhesions and bringing it out of the abdominal incision. You might say to yourselves that a demonstration of this kind shows that an appendectomy in a very acute case can be successfully done under local anesthesia and that, of course is true, but it certainly is not the best method to adopt in the usual case. I have no hesitancy in strongly recommending as the anesthetic of choice ether in the ordinary appendix operation. I have in my own experience had one series of over 1000 consecutive cases of removal of the appendix between attacks in which ether was used as the anesthetic without having a single death. Such a series is, to my mind a very strong argument in favor of ether as being certainly a safe anesthetic. It is also very efficient. You secure complete relaxation and what is very important, you place your patient in a condition in which he is entirely unconscious of the operative procedure. Taken as a whole I would recommend as I have said ether as the anesthetic of choice in appendectomy particularly in acute cases. One might employ gas and oxygen as we have done in many appendectomies. It is, however not as satisfactory as ether as a routine. It does not obtain as complete relaxation and, on the whole, is certainly not as safe as ether. I believe however that all three methods have a place and that each one has a perfectly legitimate field of usefulness in abdominal work and in the case that we have just operated on, weighing all the evidence I would advise as we did in this case the use of a local anesthetic.

The dressing is now applied and the patient is quite comfortable.

After-history — The following morning the patient was able to sit up in bed, read his paper take liquid nourishment, and was very comfortable. He did unusually well for a week following the operation. He was very cheerful and very happy over his recovery in spite of the fact that he still had the heart lesion and the sarcoma of the sternum. During the night after the nurse had left for a few moments he died evidently very suddenly from a heart attack. It was impossible to obtain a

postmortem examination of the case, but there is little doubt of its being a sudden heart death due to his old heart trouble though one cannot exclude the possibility of pulmonary embolism in the absence of a postmortem examination.

Case II.—Our second patient is a man of seventy-eight, a veteran of the Civil War who was referred to me by an old colleague of mine with whom I studied medicine in Vienna thirty years ago, Dr L. C. Taylor of Springfield, Illinois. This old veteran is a good soldier. He has been telling my assistants of the part that he and his company took in the battle of Nashville and how they captured eight guns from the enemy. I have explained to him the fact that because of his condition it would be necessary to operate on him under a local anesthetic, and he has agreed to the proposition. Dr Taylor had him under observation for some time and made a diagnosis of carcinoma at the pyloric end of the stomach with a fairly complete obstruction. He has lost a good deal of weight and is very weak from starvation. The x-ray plates show a filling defect at the pyloric end of the stomach. With the obstruction and the absence of free hydrochloric acid there is little doubt as to the diagnosis. What I contemplate doing is an exploratory operation, and we shall decide after we open the abdomen whether to make the operation purely exploratory or whether to do the palliative operation of gastro-enterostomy or resection.

I infiltrate with the same novocain solution the abdominal wall in the midline from the ensiform to an inch or two below the umbilicus, going to the left side of the umbilicus (Fig 393). I then divide through the skin and superficial fascia of the linea alba. Coming down to the peritoneum I now infiltrate this thoroughly with novocain solution. Dividing the peritoneum the full extent of the incision, I now very gently draw the stomach up into view. Pulling on the stomach is a little distressing to the patient, but he does not complain of the procedure. I infiltrate the hepatic omentum and the great omentum extending from the stomach down to the transverse colon and the peritoneum around the duodenum with local anesthetic (Fig 394). Bringing the stomach, which is fairly movable out of the abdominal cavity

you see that he has at the pyloric end of the stomach a carcinoma about as big as an egg although of course irregular in outline. The glands are not extensively involved. There is, however one

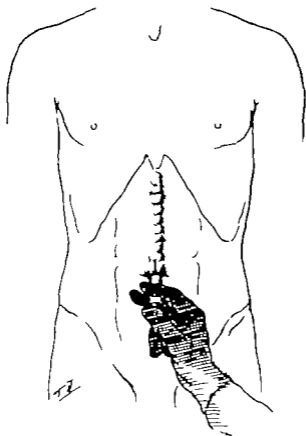


Fig. 393.—Subcutaneous Injection of line of incision, which extended from ensiform to umbilicus.

good-sized gland which is palpable over the greater curvature of the stomach and just to the left of the pylorus. There is no evidence of any other glandular involvement or of any metastatic masses either in the liver or elsewhere in the abdominal

postmortem examination of the case but there is little doubt of its being a sudden heart death due to his old heart trouble, though one cannot exclude the possibility of pulmonary embolism in the absence of a postmortem examination.

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just distal to the pylorus with a very heavy crushing forceps and ligate it off with heavy silk ligature. I now take the electric cautery and cut off the duodenum just proximal to the ligature after clamping the pyloric end of the stomach so as to prevent the escape of any stomach contents. The handling of the duodenum is the most important part of a stomach resection. It is

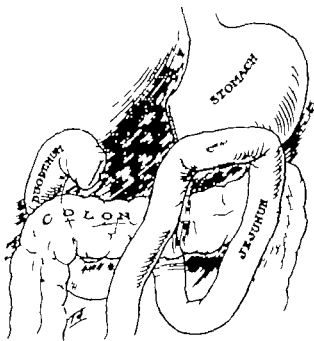


Fig. 393. —Diagram showing Billroth II method of closure with anterior gastro-enterostomy

very important to make the duodenal closure so as to prevent any leakage. I now put a purse-string suture about $\frac{1}{2}$ inch from my silk ligature on the duodenum and invaginate the stump carefully. I then tie the purse-string suture. This purse-string suture is of linen. I now put a second purse-string suture also of linen, over the first. The second one, however, is placed about $\frac{1}{2}$ inch further down on the duodenum. I now put on a stom-

cavity. On that account I intend to resect the stomach and shall do a typical Billroth second operation (Fig. 395).

Beginning near the greater curvature with a series of ligatures, I ligate the vessels between the stomach and the trans-

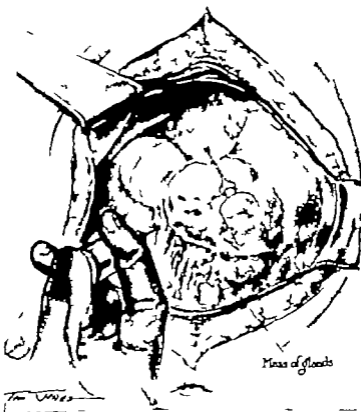


Fig. 394.—Illustration of gastroepiploic and gastroduodenal omentum before freeing tumor. Note mass of glands along greater curvature.

verse colon. This opens, of course, the lesser peritoneal cavity. I then ligate off the gastroepiploic omentum in the same way, mobilizing completely the carcinoma. I then very carefully free the first 2 inches of the duodenum. I now crush the duodenum

technic, but I think quite definitely due to a paralyzed condition of the stomach. He had had the obstruction so long that the stomach was like an old paralyzed bladder which has been distended for a long time because of prostatic hypertrophy and it takes a long time to regain its muscular power. At the end of about two weeks he began to pick up rapidly. The stomach regained its power of expulsion and he began to eat semisolid food and went on and made a very satisfactory and complete recovery.

This case again demonstrates the possibilities of local anesthesia in very extensive abdominal operations such as resection of the stomach. I have resected more than half of the large intestine under local anesthesia. We did that in a case in which the patient had a carcinoma of the bowel and also a carcinoma of the larynx. The carcinoma of the bowel was the imperative condition demanding relief because of marked obstruction. Because of the carcinoma of the larynx we felt compelled to do the operation under local. Here again I want to say that where the condition of the patient warrants I much prefer to do a stomach resection under ether than under local or under nitrous oxid and oxygen, but there are certain cases in which because of the age and weakness of the patient and the starved condition very often the acidosis of starvation being present, there is no choice. One cannot operate on some of these cases safely with ether and one is compelled to do the operation under local anesthesia, as we have done this morning. I feel that more and more in the future we shall extend the field of local anesthesia in abdominal work and for that matter in almost all the surgical fields. I do not, however, regard local anesthesia as ideal. I do not feel that it will ever displace general anesthetics, which have the virtue of rendering the patient unconscious and oblivious to what is being done during a serious surgical operation. There is a definite place too for the mixed procedure in which the abdominal incision is made under local, in which some of the painful steps of the procedure are made under nitrous oxid and oxygen and in which the operation is then completed under local anesthesia. The position, however, to my mind, remains

ach clamp protected with rubber tubing to the left of the carcinoma on the stomach and again with the electric cautery I divide the stomach about $\frac{1}{2}$ inch from the clamp after having, as you see put on another stomach clamp so as to prevent the escape of any of the stomach contents. I shall now close the end of the stomach with three rows of sutures the first one is simply through the mucosa, the second through the peritoneum and muscularis, and the third is a typical Lembert. We have now removed the carcinoma and have closed the duodenum and the end of the stomach. Our next problem is to unite the jejunum to the stomach. We could do this either as a posterior gastro-enterostomy or as an anterior gastro-enterostomy. I think, on the whole the anterior gastro-enterostomy in this case is to be preferred. I shall then take a loop of the jejunum about 15 inches from its beginning and bring this in front of the transverse colon, and make an anastomosis between this loop and the anterior surface of the stomach. My own impression is, there is very little difference in the result whether we make an anterior or posterior gastro-enterostomy in these stomach resections. As I understand Balfour in the Mayo Clinic, has rather favored in their recent cases the anterior position of the gastro-enterostomy. My own assistant, Dr Gatewood feels rather strongly that the posterior operation is the operation of choice, and thinks that the cases in which we have done the posterior operation have done better than those in which we have done the anterior.

The patient, as you see has stood the operation very well indeed and (as you heard him) in a fairly loud voice he is able to thank us for what we have done for him.

After-history—The patient made a very good operative recovery as far as the wound was concerned, but he had a rather hard time of it for a number of days because of what seemed like a partial gastric ileus or expressed in another way a moderately acute dilatation of the stomach. This, however was controlled by washing out twice a day morning and evening. In spite of this he vomited for a number of days. This evidently was not due to any mechanical obstruction due to failure of our surgical

TWO CASES OF MEDIASTINAL TUMOR WHICH PROVED TO BE SUBSTERNAL THYROID ENLARGEMENTS

Summary Two patients presenting the clinical signs and symptoms of mediastinal tumor. History and physical findings. Operation—both cases proved to be substernal thyroid enlargements. After history

I HAVE within the last year had two very unusual cases on my service cases in which the clinical diagnosis was that of mediastinal tumor and in which operation proved that the tumors were substernal thyroid enlargements. These cases have been so instructive to me both from the standpoint of diagnosis and surgical therapy that I have thought it worth while to report them.

Case I.—A man of fifty-five was referred to me from a neighboring state by his brother who was a medical colleague of mine. The patient had noticed for some months increasing difficulty in breathing especially upon exertion. A little later his voice became husky and at times would be almost lost. He then noticed great distention of the veins of the upper part of the chest and the neck. The veins became hugely distended especially on exertion and the chest and neck became enormously swollen. His face became cyanotic. It was quite evident that he had pressure upon the great veins in the mediastinum and on the recurrent laryngeal nerve and probably also upon the trachea and bronchi.

On physical examination by percussion the upper part of the chest was dull for an area larger than my fist in the midline beginning with the tip of the sternum. In the greatly swollen neck on the right side could be palpated by deep palpation a moderately enlarged right thyroid lobe. The x-ray showed a tumor in the mediastinum larger than my fist. There was no history of a specific lesion, the Wassermann reaction was negative and there were no physical findings of aneurysm. The aneurysm was ruled out as a probability but not entirely as a

unchanged and ether remains the anesthetic of choice. In those cases such as the 1000 appendectomies which I have just referred to in my own series in which ether was used without a single death, where there is no special reason for employing a local anesthetic or gas and oxygen or where there is no definite contraindication to a general anesthetic, I would employ ether

tance of about 3 inches below the sternum but I could not bring the mass out of the chest as one ordinarily can even in a good

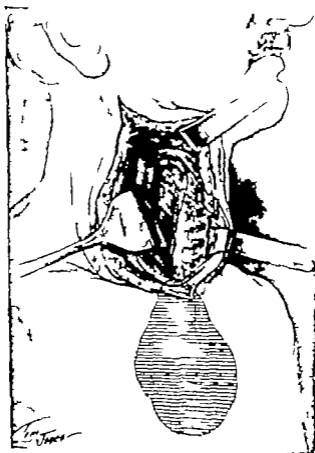


Fig. 396.—Mediastinal thyroid. Note incision parallel to sternocleidomastoid muscle. The oncolyoid has been divided. The recurrent laryngeal is clearly seen. No evidence of the thyroid gland (shaded area) visible except when patient swallowed.

sized substernal goiter. I then thought of another procedure that might enable me to bring the tumor out of the chest cavity. I ligated separately the thyroid vessels and very carefully sepa-

possibility in the case. The clinical diagnosis was that the tumor in the mediastinum was an enormous substernal thyroid enlargement probably with an enlarged right lobe of the thyroid which could be palpated.

The symptoms of pressure had grown steadily worse week by week, and operation for relief was evidently absolutely indicated even though it carried with it considerable risk. I made up my mind to attempt to see what could be done under local anesthesia from above, and that if it could not be removed by opening the mediastinum through the neck incision I would either at that time or later divide the upper half of the sternum by a vertical incision and saw through the sternum about 3 inches below its upper end, separate the two halves of the sternum with some powerful separator like we are using in work on the chest for separating the ribs, and attempt to obtain an exposure that would enable me to remove the mass if it were possible to accomplish this. I felt that if the mediastinal mass was benign in order to save the patient's life it would be necessary to remove it. The patient was a very level-headed, intelligent man whom I knew would co-operate with me in every possible way in the undertaking.

Under local anesthesia I made an incision along the inner border of the sternocleidomastoid from the angle of the jaw down to the sternum. I divided the sternal insertion of the sternocleidomastoid, divided the deep cervical fascia, and exposed the anterior belly of the omohyoid, and divided this so as to gain a wider exposure. This enabled me to bring into view the moderately enlarged right lobe of the thyroid gland. Retracting the edges of the incision so as to open it widely I introduced the index finger of the right hand into the mediastinum following the surface of the thyroid gland. Without any difficulty I could not once convince myself of the fact that the moderately enlarged thyroid gland which we palpated in the neck extended into the huge tumor in the mediastinum which we could see in the x-ray picture. With the gloved finger I attempted to find a line of cleavage between the tumor and the other structures in the mediastinum. I could do this for a dis-

cedure at that time. I therefore packed in some iodoform gauze which very readily controlled the bleeding, closed the upper part of the incision but left the lower part open for the iodoform gauze.

Fortunately the patient made a very excellent operative recovery. The removal of a considerable mass of thyroid tissue from the mediastinum relieved him very greatly of the pressure symptoms. The venous engorgement within a few days was distinctly less and breathing was freer and less arduous and within a short time the evidence of pressure on the recurrent laryngeal nerve was distinctly diminished. He remained under my observation at the hospital for several weeks and left the hospital with a suppurating sinus which I thought would probably close within a short time so I allowed him to return to his home in Ohio to report to his attending physician. The attending physician kept me posted as to the future outcome of the case which was interesting and very satisfactory. After a rather long period of profuse suppuration he finally passed a sloughing mass probably a considerable part of the thyroid and the fistula then closed and he was practically entirely relieved of his pressure symptoms. During this period I did two things which I thought might have some value in diminishing the amount of thyroid tissue which I had left in the chest. There had been no toxic symptoms, so I did not hesitate to put him on moderate doses of thyroid extract. We also gave him some x-ray exposures, with the thought that these might prove of benefit. The final outcome was very satisfactory to the patient in the sense that he is cured of the condition, and x ray examination shows the entire disappearance of the substernal mass.

Case II.—This case is one which I have recently had under observation and one which had been studied by several of my colleagues, Dr Sippy, Dr Herrick and Dr Abbott, at the Presbyterian Hospital.

The patient was a man about fifty years of age who had within seven or eight weeks developed very marked pressure symptoms in the mediastinum, loss of the voice, pressure upon the veins and upon the trachea and bronchi and great difficulty

rated the thyroid lobe in the neck from the surrounding structures isolated the isthmus of the thyroid, and divided it so that I could free the entire right lobe at least that part of it that was in the neck from the surrounding tissues, ligating at the same time the inferior thyroid vessels and hugging the posterior surface of the thyroid closely so as to avoid injury to the recurrent laryngeal nerve. When I completed this I could use that portion of the thyroid gland in the neck as a handle, and I grasped it in some large sponge forceps and attempted by making upward traction with one hand and making a blunt dissection with my gloved finger around the tumor in the mediastinum, to dislocate the mediastinal tumor and bring it into view. I found however that I was unable to do this. I felt at this time if I had had a very small hand I could have introduced it into the mediastinum through the small circle that was formed at the upper part of the chest by the first rib and the sternum, and that I would have been able to have freed the tumor by blunt dissection from the surrounding tissues and brought it out of the chest. I recognized the fact, too that if I had split the upper half of the sternum and increased to a sufficient extent the diameter of the upper opening of the thorax, I would have been able to have removed the tumor. Because of my tugging at this time the patient was uncomfortable, and although he co-operated with me in every way I felt that it was not wise to divide the sternum and I thought of another possible procedure that of removing the mass by morcellement.

Using several sponge forceps, I grasped the upper end of the tumor pulled it upward and outward, and then grasped the mass a little lower with a second pair of forceps. I then removed the thyroid tissue piecemeal somewhat in the same way as we have done, following the example of the French surgeons removing fibroid tumor of the uterus by morcellement through the vaginal route and in this way we succeeded in removing a very considerable part of the subternal thyroid mass but I was certain that I had not by any means removed all of it. Finally I had considerable hemorrhage which required packing to control, and I determined to desist from any further operative pro-

this again, and as the small projecting mass came upward I grasped it in a pair of forceps, and on making gentle traction I

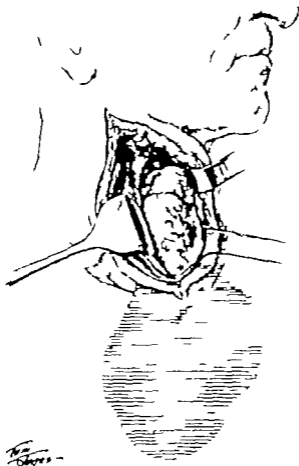


Fig. 397.—Not incision parallel to anterior border of sternocleidomastoid muscle before mediastinal portion of thyroid (shaded area) has been displaced. Upper portion of gland seen in its normal position.

found that I could pull into view and entirely out of the chest the mediastinal thyroid mass about 4 inches in length and

in breathing and marked dilatation of the superficial veins of the upper part of the chest and neck. My colleagues had studied very carefully the physical findings and found an area of dulness in the upper half of the mediastinum. They found that the esophagus was normal. There was no definite evidence of aneurysm, no history of a specific lesion, and the Wassermann was negative. The most interesting bit of evidence they succeeded in obtaining was that in making a fluoroscopic examination of the chest they could see a tumor about as large as a good-sized Bartlett pear which moved up and down in the chest with swallowing. The tumor was apparently somewhat to the right of the midline. Careful examination of the neck revealed no palpable thyroid gland, and, as a matter of fact, one could not palpate any thyroid gland tissue at all.

My medical colleagues had discussed a number of possibilities—mediastinal tumor, substernal thyroid, and the vague possibility of aneurysm—which, however, they pretty definitely excluded. When they called me into consultation and presented the evidence which they had obtained, I suggested an exploratory operation, exposing the mediastinum from above under local anesthesia. The recommendation was submitted to the patient, who was eager to have an effort made to relieve him of the increasing obstructive symptoms. Without any preliminary morphin I made an incision along the anterior border of the sternocleidomastoid (Fig. 397) as in the previous case, and after dividing the omohyoid and the deep cervical fascia I could freely expose the thyroid cartilage and the trachea, and in the ordinary position of the right lobe of the thyroid gland there was no thyroid gland at all. I then continued my dissection until I could expose the upper part of the mediastinum following the trachea and esophagus downward. I then retracted the edges of the incision widely and then asked the patient to swallow and as he did this, coming up from the mediastinum was what appeared like a large lymphatic gland, about as big as the end of my finger. This would come up as he attempted to swallow and then, as he finished the effort of deglutition, it would pass back out of sight into the chest. I asked him to do

CLINIC OF DR. ALLEN B KANAVEL

WESLEY MEMORIAL HOSPITAL

SPLENECTOMY UNDER LOCAL ANESTHESIA IN A GREATLY DEBILITATED PATIENT

Summary Patient suffering from Haemot cirrhosis, its marked anemia, anikemia, loss of weight, reduced coagulation time and in such condition as to preclude splenectomy under general anesthesia. Operation performed under local anesthesia by Labat method recovery

THE patient here presented No 90,816 is in so precarious a condition that the possibility of recovery from an operative procedure is very slight. He is greatly debilitated and has suffered from cirrhosis of the liver and its accompanying pathologic changes for over three years.

I have already discussed with you in previous clinics the indications for and results of splenectomy. At that time I drew your attention to the fact that the pathologic conditions which are most definitely and favorably influenced by splenectomy are hemolytic jaundice, Banti's disease, Gaucher's disease, and certain types of syphilitic and malarial hypertrophy. I also pointed out that removal of the spleen in hypertrophic cirrhosis of the liver is still in a more or less experimental stage, and that we are justified in the procedure only if we choose cases under proper precautions, after careful clinical study and detailed laboratory examinations, directed toward estimating the extent of pathologic change in the various body functions. Under such conditions an increasing series of cases will eventually indicate what results may be hoped for from surgical treatment, and with what type of cases and in what stage of the disease operation may be successfully carried out. I shall not discuss these questions further with you today but draw your attention to the technique used in the preparation of the patient and in the treatment of

about 2 inches in diameter. The mass was shaped somewhat like a pear the upper pole being much smaller than the lower pole. By careful blunt dissection with my gloved finger and with a gauze sponge I could free the surrounding areolar tissue and dislocate the mass entirely out of the chest cavity into the neck. I then ligated the superior thyroid vessels which were 4 or 5 inches longer than normal. I then ligated the inferior thyroid vessels. As I dislocated the entire mass into the neck incision I found that it extended over the trachea to the left side. I could readily have removed all of it, but I could not help but feel that it was probably all of the thyroid gland tissue that the man possessed. There seemed to be no evidence of any thyroid tissue on the left side except that continuous with the tumor which I had pulled out of the mediastinum. I therefore left a small portion of the left side of the tumor clamping it off from the main tumor and sewed up the raw surface with catgut sutures to control hemorrhages.

The patient stood the operation very well indeed and co-operated with me in every possible way. Fortunately the wound healed promptly. I made no drainage of any kind. The pressure symptoms have been relieved. The patient is still somewhat hoarse, evidently from the tugging on the recurrent laryngeal nerve or else from the long-standing pressure of the tumor itself from which the nerve has not yet recovered. At the present time, some weeks after operation, the patient seems to be on the road to complete recovery.

We have, of course had a great many cases of subaternal thyroid which were comparatively easily removed at the time of the thyroid operation. These 2 cases, however presented such unusual features and were so instructive that I have felt that they were of general interest and should be reported.

on examination that the patient belongs to Group I, according to Moss's classification and we have secured a donor from Group IV. In other words, we will give the blood of a member of the 'universal donor' group to a member of the 'universal recipient' group. The patient has had large amounts of fluid during the past twenty-four hours in the hope that the function of his kidneys will be stimulated. He has been given as much food as possible so that in spite of the fact that it has been necessary to give it in fluid or semifluid form because of the hemorrhages that have followed the administration of solid food he has for some time received the equivalent of 3500 calories daily.

Before coming to the operating room he was given a preliminary injection of scopolamin $\frac{1}{16}$ gr. and morphin $\frac{1}{4}$ gr. not sufficient, of course, to produce complete anesthesia but sufficient to lessen his response to his surroundings. We shall use for local anesthesia $\frac{1}{2}$ per cent. novocain with 5 drops of 1:1000 adrenalin chlorid solution per ounce. We will first anesthetize the anterior abdominal wall. This can be done by a variety of methods and should be entirely painless throughout the injection. My own procedure is first to inject the superficial layer of the skin at the points at which we expect to introduce the solution. The points chosen for injection are first immediately below the xiphoid cartilage, second at the junction of the tenth rib with the abdominal wall, and third about 1 inch above the umbilicus at the outer edge of the rectus on either side. Through the wheals previously made with a fine needle a fairly large needle $\frac{1}{4}$ inches in length is passed through the skin with a boring motion so that the surrounding subcutaneous tissues may be injected. The needle is also passed into the rectus muscle and from $\frac{1}{4}$ to 1 ounce injected into its substance; ordinarily the former amount is sufficient. In this case I am having some difficulty making sure that my needle lies in the rectus and not in the peritoneal cavity because of the extreme thinness of the abdominal wall, the distention of the abdomen incident to the enlargement of the liver and spleen, and the considerable amount of fluid that is present in the peritoneal cavity. By forcing fluid ahead of the needle however as we pass through the space

this particular case, reserving for a future time the report of the results obtained in this type of disease and this particular patient.

The salient points of the history are that the patient is suffering from pain in the upper abdomen, cough, dyspnea and edema of the ankles. He has lost 40 pounds in weight and has had repeated hemorrhages from the gastro-intestinal tract, blood appearing both in the vomitus and in the stools. These symptoms date back to 1917.

On examination he presents the characteristic findings of hypertrophic cirrhosis of the liver with moderate emaciation, enlargement of the liver and spleen, ascites and deep jaundice.

His red cell count is 3,400,000, his leukocyte count is 11,800. The coagulation time of the blood is six and a half minutes, and the clot is very soft. The fragility test shows hemolysis beginning at 0.38 per cent. and complete at 0.24 per cent. The urine shows a few casts and a trace of bile. Stercobilin is present in the feces, but there is no bile. Repeated examinations of the stools show no ova or parasites. The Wassermann examination is negative.

I wish to emphasize the great debility of this patient, the low coagulation time, the marked anemia, and the impairment of function in the kidney and liver. When we remember that the liver is especially active in the excretion of poisons, the danger of anesthetizing this patient with ether or chloroform is at once apparent. Because of his weakened heart muscle the administration of nitrous oxid would be attempted only in case of necessity. With his marked anemia it is evident that he cannot stand the loss of any considerable amount of blood without jeopardizing his life, and because of the low coagulation time any operative procedure is attended by considerable risk, even by the possibility of a failure of the blood to coagulate. This is of particular importance when we remember that dilatation of the veins and thinning of the vessel walls are invariably present in cases of splenic enlargement, and that the danger of sudden and profuse hemorrhage is increased by the inaccessibility of the bleeding vessels. We have therefore prepared for a transfusion of blood to be carried out during the operation. We have found

syringe attached, so that if we should perforate a blood vessel we would recognize the fact immediately and not run the risk of injecting our anesthetic solution directly into the blood-stream

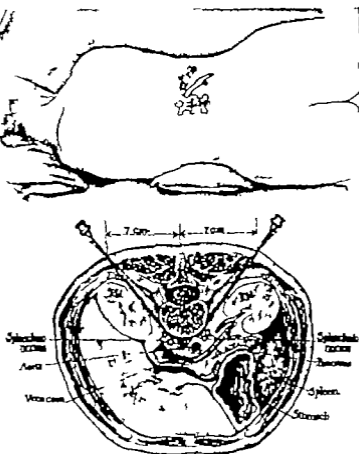


Fig. 398—Labat' method of local anesthesia (after Labat)

When the point of our needle strikes the lateral surface of the first lumbar vertebra we partially withdraw it, and reinsert it at a slightly less oblique angle, *i. e.* the point of the needle

between the internal and external oblique we are able to distend the tissues and inject between the muscles and into the rectus with safety.

We now turn the patient on his side, putting a small pad under the lower ribs, so as to keep the spinal column straight and parallel with the table. This method of injection has been described by Labat, who has practised it with considerable success. As you know laparotomy under local anesthesia is difficult, not because we cannot secure a complete anesthesia of the anterior abdominal wall nor because of the sensitiveness of the viscera themselves, but because pulling upon any of the viscera causes irritation of the celiac and other sympathetic plexuses, and is followed by intense pain. Labat's method has apparently been successful in preventing excessive pain from this source in a large percentage of cases.

It is our purpose if possible, to pass a needle obliquely inward, so as to penetrate the retroperitoneal tissues in front of the first lumbar vertebra and to inject about the abdominal sympathetic trunk a considerable amount of novocain solution. We locate the twelfth rib and twelfth dorsal spine and immediately below it the first lumbar spine. We mark the spinous process of the first lumbar vertebra and from this point draw a line in a lateral direction exactly perpendicular to the axis of the spinal column. This should intersect the twelfth rib approximately 7 cm. from the spinous process. The body of the first lumbar vertebra is also approximately 7 cm. directly anterior to the tip of its spinous process, so if at the point of intersection of our lateral line and the twelfth rib we insert a needle 12 cm. in length obliquely forward (ventrally) and inward at an angle of 45 degrees, it should strike the lateral surface of the body of the first lumbar vertebra at a distance somewhat less than 10 cm. In other words, the needle forms the hypotenuse of a right angled triangle one of whose sides is a line extending directly lateralward from the spinous process of the first lumbar vertebra and the other a line extending directly anterior (ventralward) from the same point.

You will notice that this needle is being passed without the

ooxing in this vicinity which I will control by the insertion of gauze packing. Some firm adhesions on the posterior surface are now exposed and can be cut between forceps. We have now dislocated the spleen from the abdominal cavity and have controlled its pedicle. We will place two forceps on the pancreatic and stomach side and one on the spleen side cutting as close to the spleen as possible. The two forceps on the proximal side

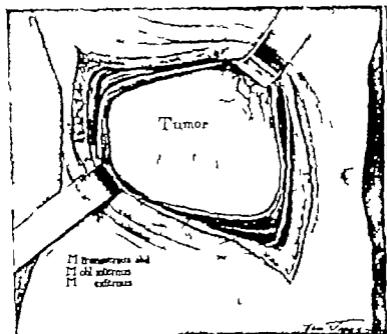


Fig. 399.—Muscle-splitting incision for the removal of retroperitoneal tumors.

are so placed as to permit the application of a ligature and to prevent retraction of these large veins, which you can readily see would be a very serious accident. The splenic artery is grasped separately with as little other tissue as possible. The pedicle is now incised between the forceps and the spleen removed. We will have it weighed and a pathologic examination made.

Instead of being directed toward the median plane of the body is directed toward a point 2 to 4 cm. lateralward from the median plane, our purpose being to slide the needle over the lateral surface of the first lumbar vertebra and penetrate the retroperitoneal tissues. As we do this I feel the needle pass over the surface of the vertebra into less dense cellular tissue at a depth of 10.5 cm. No blood flows through it, so we may feel certain we have not penetrated a blood vessel. We inject 35 c.c. of $\frac{1}{2}$ per cent novocain solution, though Labat uses as much as 35 c.c. of a 1 per cent. solution. We then turn the patient to the opposite side and infiltrate that side in a similar manner.

It is well to wait for ten or fifteen minutes before beginning the operation to permit the anesthetic solution to attain its full effect. Meanwhile the arm will be prepared for the injection of the blood and the abdomen for the abdominal incision.

We make the incision in the left rectus from below the umbilicus upward to the ribs and medialward to the ensiform cartilage. We come directly upon a tremendously enlarged liver with a roughened, mottled surface. The left and partially covered by the left lobe of the liver is the large blue spleen. It is evident I will be unable to displace the spleen through this incision since the liver is so large and so firmly fixed. I will therefore make a second incision extending lateralward, at right angles to the first, and from about its middle point. The spleen is large, and there are numerous adhesions at its upper pole and on its posterior surface, fortunately not so many as I have met with in other cases, but still sufficient to give us some anxiety. We will anticipate the possibility of hemorrhage from torn veins in these adhesions by having at hand two 5-yard rolls of gauze, prepared so that we can insert them immediately if hemorrhage occurs. I am now bringing the spleen downward and forward as gently as possible with the idea of dislocating it from the abdomen and exposing its posterior surface and upper pole. The presence of this large tortuous vein passing from the spleen to the stomach is a constant reminder of the need of gentleness. With my fingers I am gradually separating the adhesions about the upper pole. There is some little

LAMINECTOMY

Summary Patient suffering from evidences of compression of the cauda equina, the symptoms have been developing for nine months. Operation discloses the presence of small enchondroma, lying outside the dura, and adhesions involving the nerve-trunks forming the cauda. At operation the cord was exposed, the extradural tumor removed, and the nerves forming the cauda dissected free from one another. The dura and wound were closed without drainage.

In presenting this patient I wish to draw your attention to the good results that ensue upon operation for pressure on the spinal cord, in contradistinction to the results which are obtained in the ordinary patient suffering with a similar pressure on the brain. Unfortunately much of the pessimism of the medical profession as regards the cure of patients suffering from brain tumors is justified. While we all can present a fair number of patients who have recovered and have been restored to society as working members, the number who still remain charges upon society or have died within some months after the operation is many more than the number of those who have recovered permanently. In my experience, however the contrary is true in spinal cord surgery. I now have a considerable number of patients who suffered from spinal cord tumor who are back at their work, earning their livelihoods, and in many cases completely recovered as far as the functions of their bodies are concerned. The present patient to my mind presents a most favorable outlook, since we find no evidence of destruction of the vertebra, since he is suffering from a lesion in the cauda equina, and since the process has not continued for any considerable length of time.

I shall not attempt to discuss with you the findings in detail, nor the means by which we have arrived at the diagnosis, since our time is limited. In brief the patient began to complain of severe pain extending down his legs some nine months ago. This was diagnosed by his physician as sciatica. After some

We now remove the proximal of the two forceps on the pedicle in each section, and ligate with braided silk. I put on a second ligature as I remove the distal pair of forceps, so that we will have two ligatures on each section of the pedicle. We have taken care of course not to include the tail of the pancreas nor a section of the stomach in our ligatures.

Let me draw your attention to the fact that in this entire manipulation there has been considerable tugging and pulling on the abdominal viscera and yet the patient does not complain in the slightest of pain. His pulse and general condition are practically the same as before the beginning of the procedure. My associate, Dr. Koch, will now begin the transfusion, while we close the abdominal wound, which should be done in layers with catgut and silkworm-gut. I regret the fact that because of oozing that is still present at the point from which the adhesions were torn, it will be necessary to leave a small strand of gauze packed firmly against the bleeding points. This can be brought out at the lower end of our lateral incision.

As to the transfusion you will note that we are using the citrate method because we wished to have the blood ready for immediate transfusion in case of necessity. I have previously discussed with you the question of the use of citrated blood and non-citrated blood in cases in which transfusion is necessary. Either method is apparently entirely satisfactory. In our earlier group of cases it was not uncommon for us to have considerable reaction following transfusion with blood from members of the same group as the recipient. Attention has been drawn to the fact that this was due to the excessive whipping of the blood during its withdrawal. Since lessening the agitation of the blood during the procedure we have had little or no reaction from citrated blood. We will give this patient 600 or 700 c.c. of blood, keep him well covered, and send him back to his room as soon as the transfusion is completed.

Postoperative Note.—This patient made a complete recovery from the operation and was in excellent condition two weeks after the operation. The spleen weighed 1500 grams.

first to the fourth lumbar keeping as closely as possible to the median plane. This permits us to approximate the tissues more easily after the operation is concluded, and causes considerably less hemorrhage than the method we previously used of detaching the muscles from the spines and removing the spines *en toto*. Should we inadvertently pass to one side or the other as we go downward it does not make a serious difference for this method of exposing the cord is not used with the idea of securing greater strength from regeneration of the bone although this probably

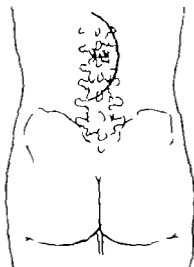


Fig. 400.—Site of skin incision

ensues. With a chisel we separate the two halves of each spine from the corresponding laminae at the depth of the incision, and separate the muscles laterally from the laminae over the extent of our incision. These are retracted to either side so as widely to expose the posterior bony wall of the spinal canal. With a bone-biting forceps inserted underneath the laminae we remove these piecemeal until the laminae of the four vertebrae have been completely removed. You will notice that here and there we have had some difficulty with bleeding as we were

weeks the pain disappeared and the patient continued his work in a logging camp. About three months ago the pain returned with increased severity and was followed shortly after by a complete retention of urine. An examination by his physician disclosed the presence of anesthetic areas, and a beginning paralysis of some of the muscles of the lower extremity. This has continued until the present time so that the patient is now unable to walk without crutches, although he has not a complete paralysis of his legs. In other words, while he has had more or less girdle pain across the ilio-inguinal fold it has not been typical, nor has the paralysis and anesthesia which followed been of the massive type. He has both an irregularity in the distribution of his paralysis and in the distribution of his anesthesia.

Operation upon these patients is generally carried out under general anesthesia although it can be carried out under local anesthesia. The mortality is extremely low and the results are such as to justify an exploratory incision in case of doubt, though here the symptoms seem to be so definite that we believe we are dealing with a definitely localized process probably a tumor.

As you will see the patient is placed upon his face with sand bags under his shoulders to support his head and make the work of the anesthetist easier. We make a curved incision extending from the left side of the fifth lumbar vertebra across the line of the spine, upward to the eleventh dorsal vertebra, and back to the left side. We retract this flap of skin and subcutaneous tissue to the left, and attach sterile towels to the edges of the skin incision so as to protect the operative field as completely as possible. The ligamentous tissue between the spines, from the fourth lumbar to the twelfth dorsal spines, is now incised in the median line since it is my purpose to remove the upper four lumbar vertebrae and proceed upward or downward as may be indicated after opening the dura. With needle 4 inches in length we measure the length of the spines and the depth at which the laminae lie so that in sawing through the spines we will not penetrate the spinal canal. With circular saw attached to the motor we now incise the spines from the

We have now removed the cellular tissue outside the dura and can see here opposite the third lumbar vertebra, a small cartilaginous body the size of a bean. It seems to be attached to the surrounding tissues and yet not grown from them. I am somewhat in doubt as to whether it is a neoplasm or whether

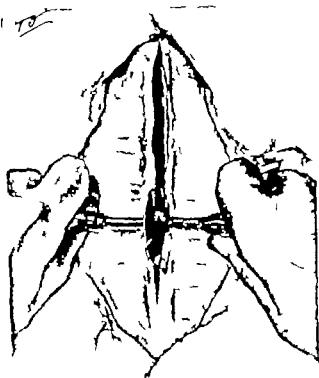


Fig. 402.—Motor saw dividing the spine in the midline.

it is a hypertrophy of cartilaginous tissue incident to irritation. We will now open the dura, and you will notice at this point that it is much constricted and whitened. You can see here that the entire group of nerves forming the cauda is bound by fibrous adhesions extending over a distance of $\frac{1}{4}$ inch that above this point the nerves are injected and edematous, and below they

detaching the muscles. In these bleeding spaces I have placed small pledgets of cotton to which are attached silk ligatures, so that they will not inadvertently be left in the wound. Where we have oozing from bony surfaces it can be satisfactorily controlled with bone-wax.



Fig. 401—Method of determining the distance to the lamina (A) incision of the ligaments between the spaces.

In my earlier cases I was inclined to make too small an incision, and was sometimes compelled to remove the spine and laminae of a vertebra above or below after the dura had been opened, a procedure that was at times followed by oozing into the subdural space—a condition which we try to avoid.

traumatism. We will remove this small growth outside the dura and close the dura with continuous fine silk. The muscular tissue and the separated spines are sutured in layers with heavy catgut, and the skin is sutured with silkworm-gut.

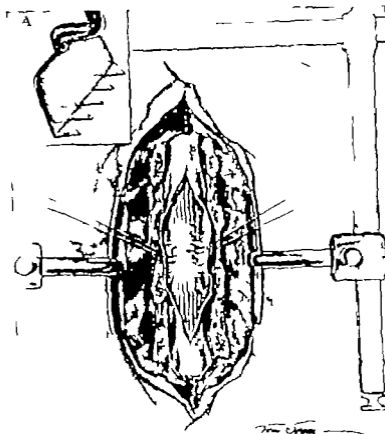


Fig. 404 — Scar tissue binding the nerves to one another and to the dura; the mechanical retractor holding muscles aside.

Postoperative Note—The patient made a satisfactory recovery from the operation and at the end of two weeks had regained complete control of his bladder. There was entire restoration of sensory function except over an area about 2 inches in

are quite pale. I use magnifying glasses to permit me to see the details of the nerve structure more clearly than with ordinary vision and to enable me to dissect out the nerves from the scar tissue which surrounds them, without injuring them in any way



Fig. 40 — Breaking off the split sprues at their bases

Fortunately I am able to separate them in their entirety. We are very careful to prevent the entrance of blood into the spinal canal, and are extremely careful not to traumatize the nerve tissue although, of course, this dissection must involve some

CLINIC OF DRS ALBERT J OCHSNER AND JOHN NUZUM

AUGUSTA HOSPITAL

LIGATION OF THE INFERIOR THYROID ARTERY AND VEIN ACCORDING TO THE METHOD INTRODUCED BY PROFESSOR DEQUERVAIN THE USE OF LOCAL ANESTHESIA IN THESE OPERATIONS AND IN THY ROIDECTOMY

Summary Difficulty of ligating inferior thyroid artery. Simplicity, safety and efficiency of technique introduced by Professor Dequervain. In 1 case of severe hyperthyroidism only one vessel should be ligated at a time. Advantages of local anesthesia in this procedure and in thyroidectomy in general. Technique of resection. Analysis of 107 thyroidectomies performed under local anesthesia.

THE ligation of the superior thyroid artery and vein is so simple that surgeons have naturally fallen into very similar if not identical methods. This is not the case with methods of ligation of the inferior thyroid artery.

The superior parathyroid glands are found usually one on each side at the posterior borders of the lateral lobes of the thyroid gland opposite the cricoid cartilage. The inferior parathyroid glands which are supplied by small vessels from the branches of the inferior thyroid artery occupy the cellular interval at the posterior aspect of the inferior thyroid artery and the recurrent laryngeal nerve. It is this close relationship of the recurrent nerve and the inferior parathyroid glands to the posterior aspect of the lateral lobes of the thyroid gland which has induced surgeons in excision of one of the lobes to make the resection intracapsular at the posterior aspect of the gland the posterior part of the capsule along with a layer of thyroid substance being left behind attached to the trachea. In this way injury to the recurrent nerve and parathyroid glands is avoided.

diameter on his left buttock. Recovery should be complete as regards motor function and the restoration of the patient to society.

I wish to present to you briefly this patient, No. 6,943 operated on at a previous clinic who suffered from a large tumor mass in the right side in the neighborhood of the kidney. The mass was apparently 6 or 7 inches in diameter smooth and not particularly painful. Before operation a diagnosis of tumor of the kidney was made. A lateral transverse incision (Fig. 401) as you can see, was made extending from the right rectus back to the region of the kidney. The mass was large and protruded outward so as to permit us to divide the oblique muscles and transversalis in the line of their fibers. The peritoneum was pushed forward and underneath it was found a hard, solid tumor not connected with the kidney. The tumor was shelled out from the retroperitoneal tissue without great difficulty there being no pedicle as far as we could determine. The kidney lay somewhat above it and behind it. The mass was 9 inches in one diameter and 7 in the other. On examination it was found to be a fibrosarcoma.

The case is an extremely interesting one first, from the fact that although the tumor was so large it had not been recognized until six months before second, from the fact that the patient is sixty years of age and third because we were able to remove the tumor without difficulty through a muscle-splitting incision.

This incision I have used a number of times in cases in which it has been necessary to reach a tumor lying at the hepatic or splenic flexure of the colon, and for exposing large tumors of the kidney. If the patient is short and muscular the incision is sometimes made with difficulty but ordinarily if the tumor is of good size and the patient not of excessive muscular development, the incision is made without difficulty and leaves an excellent line of muscular apposition with no danger of postoperative hernia and particularly no bleeding from the wound.

tion in which the nutrition of the inferior parathyroid gland has been disturbed without direct injury to the gland itself the gland acts the part of a transplanted parathyroid taking up its nutrition from the surrounding tissues and resuming its function after a relatively short time

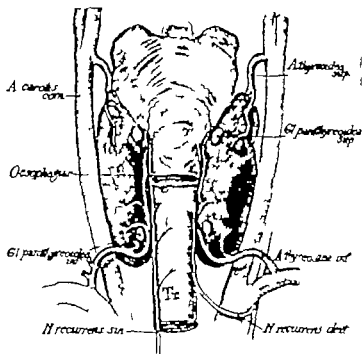


Fig 405 —Anatomic relations of the recurrent laryngeal nerves to the inferior thyroid arteries at the so-called danger zone (as viewed from behind)

It has been found in animal experimentation that these transplanted parathyroid glands are much more likely to grow and to function in cases in which their secretion is needed than in those in which the remaining glands are sufficient to supply the physiologic demands hence it usually requires bridging over with calcium lactate for only a relatively short period in our experience not more than two or three weeks.

as the branches of the inferior thyroid artery are ligated after they have pierced the capsule. Dequervain, on the other hand, prefers to ligate the main trunk of the inferior thyroid artery before it pierces the sheath of the thyroid gland just to the inner side of the common carotid artery.

In the ligation of the superior thyroid artery there is no danger of injuring contiguous anatomic structures neither is there danger of injury because of interference with the circulation of structures outside of the thyroid gland itself.

In this respect also there is a marked difference in the effect of ligation of the inferior thyroid vessels.

In many cases of ligation of the inferior thyroid vessels the parathyroid gland has been injured by direct trauma in case the ligation has been accomplished at the point at which the inferior thyroid artery crosses the recurrent laryngeal nerve at a point directly in front of the inferior parathyroid gland near the outer border of the trachea (Fig. 405).

This point has been chosen by many for the ligation of the inferior thyroid artery because the structures can be located very readily at this location. Again, the inferior parathyroid gland may be destroyed by trophic or absorption or greatly reduced in its physiologic action in case the inferior artery is ligated at this point because the main vessel supplying blood to the inferior parathyroid gland is a branch of the inferior thyroid artery which is frequently given off at a point very near the location of this ligature, so that the inferior parathyroid gland may be deprived of its entire blood supply or at least of the greater portion of this. In the former case the harmful effect consisting of tetany in a more or less severe form may be permanent. In case the gland is deprived only of a portion of its blood supply the effect will be less severe in proportion to the amount of blood-supply that has been lost to the gland. As a rule compensation will take place through collateral circulation, so that the symptoms of tetany will disappear entirely after treatment, which should consist in the administration of calcium lactate in doses of 10 to 30 grains every two to six hours.

It seems likely that in cases in which tetany follows an opera-

amount of traumatism incurred by this method is so severe that one should look for a method which is equally efficient, equally safe against secondary complications, and which subjects the patient to a smaller amount of trauma and which at the same time will be much more effective than if the ligation is made as in subtotal thyroidectomy just described.

For all cases then in which the surgeon desires to reduce the amount of hyperthyroidism by ligating the inferior thyroid vessels on one or both sides, either alone or in combination with ligation of the superior thyroid vessels, which should always be done at intervals of not less than a week it would seem proper to adopt a method which is simple, safe, and free from injuring any important structures either directly or indirectly and which at the same time will be certain to reduce the degree of hyperthyroidism present by reducing the blood-supply to the thyroid gland to the desired degree. The operation for the ligation of the inferior thyroid vessels developed and described by Professor Dequervain and practised by him in a large number of cases seems to fill all of these requirements. It has proved eminently satisfactory in our practice at the Augustana Hospital.

It may be well to state here that it is probably best never to ligate more than one vessel at one sitting because a patient whose condition is so serious that it would not be safe to perform a partial thyroidectomy under local anesthesia should be exposed only to the smallest possible strain at any one time *i. e.* the ligation of a single vessel under local anesthesia.

The operation can be performed readily under local anesthesia with $\frac{1}{2}$ of 1 per cent. of novocain solution or any one of its equivalents injected opposite the second and third cervical vertebrae in the course of the nerve supplying the tissues involved in the incision in the skin and the space behind the sternocleidomastoid muscle according to the method to be described in detail. The exposure of the vessel is accomplished without pain.

The transverse collar incision of Kocher results in the slightest degree of deformity because it is thoroughly symmetric, consequently it is wise to make the incision in the line to be occu-

If the inferior thyroid vessels are ligated during the operation of thyroidectomy the *direct or indirect injury to the inferior parathyroid gland* can of course be avoided by grasping the lower pole of the lobe of the thyroid gland from without inward and upward so that the vessels are included in the bite of the forceps together with the substance of the thyroid gland, provided one is careful to place the forceps so that every portion of the tissue compressed is in front of the posterior capsule of the thyroid gland because this will compress the thyroid artery at a point beyond the portion from which the branch supplying the parathyroid gland is given off.

Moreover by following this rule the surgeon also avoids injuring the trachea and the recurrent laryngeal nerve because these structures also lie behind the posterior capsule of the thyroid gland.

What has been said concerning injury to the inferior parathyroid gland when the inferior thyroid vessels are ligated at the most convenient point, namely where the inferior thyroid artery crosses the recurrent laryngeal nerve near the trachea, applies equally as regards injury to the recurrent laryngeal nerve and injury to the trachea.

In the cadaver it is a very simple matter to recognize the recurrent laryngeal nerve at this point in the form of a white threadlike structure and even in the living subject this can be done, if the field is kept perfectly dry by carefully picking up even the smallest vessels and ligating at once but even the irritation caused in making the manipulations necessary to expose the recurrent laryngeal nerve may suffice to cause at least temporary paresis or paralysis.

The question then arises Why not in all instances in which one desires to ligate the inferior thyroid vessels follow the plan of ligating in front of the posterior capsule of the thyroid gland?

It seems clear that where the ligation is a step in the operation for removal of a lobe of the gland that this is the plan one should follow.

In patients, however whose condition makes so serious an operation as even a partial thyroidectomy contraindicated the

Although it is necessary to bear the possibility of this accident in mind, it may never occur and the more constantly one bears the possibility in mind the less likely it is to occur

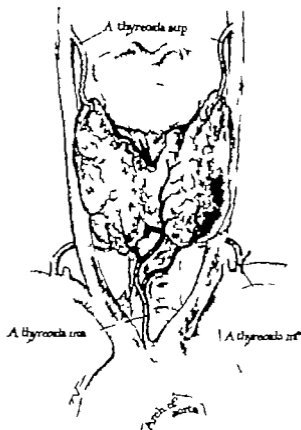


Fig. 406.—The thyroidea ima artery (present in about 10 per cent. of patients) is shown arising from the arch of the aorta. Occasionally it springs from the innominate artery

After exposing the artery carefully for a distance of 1 cm. from its origin a double catgut ligature is carried behind these vessels with an aneurysm needle drawn through, and cut so as

pied later on when thyroidectomy is to be performed. The lateral extensions of the incision are about 3 cm. in length and extend a little beyond the outer border of the sternocleidomastoid muscle. After reflecting the flap an incision 5 cm. in length is made along the outer margin of the sternocleidomastoid muscle through the fascia beginning at a point 3 cm. above the clavicle and passing upward and outward in the line in which the Kocher incision will extend later on when a thyroidectomy is made. This portion of the muscle is then loosened from its posterior attachment by blunt dissection down to a point where the finger can feel the pulsation of the carotid artery. At this point the fascia occasionally offers somewhat greater resistance but one can usually overcome this by burrowing into the depth in front of the carotid artery with the end of the finger until the anterior surface of the common carotid artery has been freely exposed. By passing the finger upward and downward gently remaining close to the border of the carotid artery one's progress is interrupted by the inferior thyroid artery usually above the center of the free space in front of the common carotid artery (Fig. 406).

In many cases, however, the inferior thyroid artery has a lower origin and will be encountered in passing the finger downward from the center of the free space in front of the common carotid artery.

At this point it is important to avoid all unnecessary traumatism because the inferior thyroid vein is often very thin walled, and if one is violent in his manipulations it is possible to tear the wall of the vein or even to sever the connection between the deep jugular vein at the point at which the inferior thyroid vein enters this structure. In either case there will be very troublesome hemorrhage which can best be controlled by pressing outward against the deep jugular vein with the end of the finger until a smooth round-nosed clamp or forceps can be applied to the opening. It is usually best to leave the forceps in place forty-eight hours rather than to attempt the application of a ligature in case the wound is in the jugular vein. If the wall of the inferior thyroid vein has been torn, a ligature should be applied to each side of the tear and the vein cut between the two ligatures.

Under normal conditions the anterior jugular vein when compared with the internal and external jugular is so small that it can be recognized only with difficulty but in the presence of

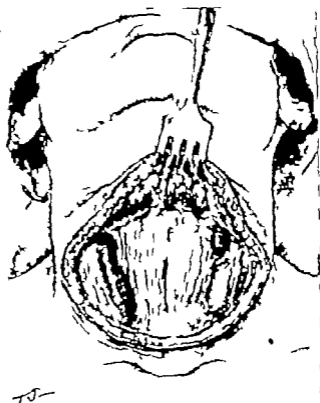


Fig. 407 — The anterior jugular veins when markedly dilated are dissected from their bed, doubly ligated and covered between ligatures, as shown on the left of the drawing.

goiter we have frequently encountered this vein greatly enlarged, at times having a diameter of more than 1 cm.

Now only the superior thyroid artery and vein remain on either side and unless one contemplates the removal of one or both lobes of the thyroid gland at the same time, it is usually

to make two ligatures. One of these is tied carefully at the point where the vessel comes past the common carotid artery and the second ligature is tied at a distance of 1 cm. from the first, and the vessel is cut between the two ligatures.

It is better to choose this method than to apply two clamps or artery forceps cutting between these and ligating because the former method precludes the inclusion of tissues aside from the vessel and insures against slipping.

After tightening each ligature and before making the second tie of the knot it is well to ask the patient to speak and to request her to cough. The latter is worth while because patients cannot simulate hoarseness in coughing as easily as in speech. In case of any hoarseness, the surgeon will know that the recurrent laryngeal nerve is in an aberrant position and has been included in the ligature. We have never experienced this accident but it is said to be possible. In case it should occur one would of course loosen the ligature and carefully inspect the field of operation and shove the nerve to the inner side quite beyond the grasp of either ligature. In case the nerve is not in an aberrant position it is a considerable distance from the point at which these ligatures are applied. The wound is closed at the conclusion of the steps which have been described.

It usually seems wise because of the condition of the patient, to ligate only the inferior thyroid artery of one side at the first session.

If it is desirable to reduce the blood-supply of the thyroid gland still further the same steps may be repeated on the opposite side after an interval of a week or longer according to the condition of the patient. In this case it is well to inspect the lower edge of the gland in order to determine the presence of the thyroidea ima which enters one or both of the isthmus from below (Fig. 405) directly in front of the trachea. Occasionally vein 5 mm. or more in diameter may be found in this location. This should be carefully laid free and ligated doubly and cut between the two ligatures.

In case the anterior jugular vein is prominent (Fig. 40) on one or both sides this should be treated in the same manner.

rule show marked improvement because a considerable proportion of the blood-supply will be prevented from entering the gland following the operation. Usually the benefit is greater from ligating one inferior thyroid artery than from ligating both superiors and if this method is followed the resulting trauma is less than that resulting from the ligation of one superior thyroid artery.

This operation and, in fact, all operations in patients suffering severely from the effect of diseased thyroid glands should be performed under local anesthesia because general anesthesia in itself is many times more dangerous than this operation in these cases. The following method is in general use in our clinic.

Among the patients presenting themselves at our clinic at the Augustana Hospital for relief of symptoms due primarily to disease of the thyroid gland a recent series of 107 patients had thyroidectomies performed under local anesthesia. During the same period of time from January 1, 1920 to October 30, 1920 we have had the opportunity of comparing the former method with alternating operations done under ether anesthesia. The advantages of nerve blocking in thyroidectomy are so obvious, postoperative convalescence relatively free from thyrotoxicosis and the results so gratifying both to the surgeon and patient alike as to warrant a detailed description of the method employed.

Since ether anesthesia must of necessity increase the hazards of operation and often throw an added burden on the myocardium and nervous system already badly damaged from prolonged hyperthyroidism all exophthalmic goiters and toxic adenomas were uniformly selected for local anesthesia. The atoxic simple colloid goiters were given the choice of local or general anesthesia.

Experience has proved that the method under discussion possesses the following distinct advantages: 1. The patient can at all times talk to the surgeon thus abolishing the chance of injury to the recurrent laryngeal nerves.

2. By conversation with the patient his general condition can be accurately determined at any given time. This is extremely important, since Crile has shown that general anes-

not wise to ligate either or both of these groups of the superior thyroid vessels at the same sitting at which one ligates the vessels that have been described above, because a patient who has a sufficient amount of resistance to undergo the ligation of several of these vessels at one sitting can readily withstand a subtotal thyroidectomy under local anesthesia. This fact has been reiterated in this paper because it is the one point in which most surgeons are almost certain to commit fatal errors unless their attention has been directed to this danger very specifically.

The object of this paper is to point out the simplicity, safety and efficiency of this method of ligating the inferior thyroid artery which was first developed and described by Professor Dequervain of Berne.

There is no danger of injury by this operation to the parathyroid gland, the recurrent laryngeal nerve or the trachea either directly or indirectly because the field of operation does not approach these structures sufficiently to permit direct trauma, and there is always a sufficient amount of collateral circulation, so that the nutrition of the inferior parathyroid gland will not be interfered with.

There is a definite group of cases of goiter belonging to the variety of exophthalmic and toxic goiters in which this operation is positively indicated.

The group includes cases in which subtotal thyroidectomy must be performed sooner or later in order to obtain a permanent recovery but in which the condition is such as to make this operation unsafe even after the use of rest and dietetic treatment, or cases in which the improvement is so slow that the operable stage cannot be expected in a reasonable time.

The operation if performed on one side only causes so little shock or depression that it is not likely in any case to reduce the patient's chances for recovery.

Of course, there are patients suffering from goiter so far advanced that there is no chance of recovery and occasionally one may undertake this operation in one of these cases with a fatal result.

Cases that recover from the little operation however as a

region is cleansed with alcohol carefully dried and painted with 3½ per cent. tincture of iodin

The solution employed may be freshly prepared as follows

Apothosene ¹ (Parke Davis & Co.)	gm. 0.6 = gr. 7.5
Sodium chlorid	gm. 0.8 = gr. 12
Aqua destillata	q. d. 100 c.

After adding the apothosene and sodium chlorid to the sterile distilled water the solution is slowly brought to boiling for three to five minutes to insure absolute sterility. The entire quantity of 3½ ounces may be accepted as the average amount to be injected although we have on numerous occasions employed twice this amount of the solution in ½ per cent. strength without noting any immediate or subsequent deleterious effects. The sodium chlorid solution is added with the definite purpose of approximating a physiologic saline solution of the same osmotic tension as the blood since local necrosis irritation of the skin-flaps, and delayed healing are known to follow the injection of distilled water in large amounts. Adrenalin solution (1:1000) minus 10 per 100 c.c. may be added after preliminary boiling which, due to its vasoconstrictor action, both prolongs and intensifies the degree of analgesia. It possesses however this distinct disadvantage the intense ischemia of the operative field leads to a false sense of perfect hemostasis with possible subsequent hematoma formation. Furthermore when using adrenalin in the solution analgesia develops more slowly and it is desirable to wait thirty minutes before operating. Without the adrenalin anesthesia is complete within three to five minutes after injection. Its duration varies from one to two hours in the average patient.

Technic of Injection.—The usual preparations completed local anesthesia is effected by employing a combination of two different methods. 1 By the intradermal and subcutaneous injection of the apothosene solution along the proposed curved

¹More recently we have employed procain as ½ per cent. solution with equally satisfactory results. It would seem that the American substitutes for novocain represent eminently satisfactory

thetia fails to inhibit the painful afferent stimuli and only alters their physical interpretation. The position of the patient's head, dyspnea, pressure of instruments on the neck, etc. all may serve as factors whose summation lead up to surgical shock. With nerve-blocking these afferent sensory stimuli are cut off and the central nervous system protected.

3 The dissection of the skin-flap is more quickly and easily done since the subcutaneous tissues of the neck are thickened, due to the inhibition of the solution injected.

4 Local anesthesia demands extreme gentleness of manipulation, sharp clean dissection and minimal trauma of the tissues—factors in general essential to good surgery.

5 The patient takes liquid nourishment by mouth immediately after operation thus eliminating proctochylis which is disturbing to nervous toxic individuals.

6 Postoperative nausea, vomiting and writhing are practically eliminated, and with them the tendency toward hemorrhage.

7 The preliminary dose of morphin benumbs the patient's cerebration sufficiently to largely eliminate the fear of the operation and the transitory increase in pulse-rate.

8 With carefully prepared solutions, healing occurs by primary intention in 100 per cent. of cases.

9 Postoperative bronchopneumonia as a sequel of operation is unknown.

10 The incidence of postoperative thyrotoxicosis has, in our experience, been markedly diminished.

11 Finally the use of local anesthesia brings the operation to those extremely toxic individuals who could not withstand general anesthesia.

The adult patient receives a preliminary hypodermic injection of morphin gr $\frac{1}{4}$ combined with tropin sulphat gr $\frac{1}{10}$ two hours prior to operation and a second hypodermic injection of morphin, gr $\frac{1}{4}$ with atropin sulphat gr $\frac{1}{10}$ one hour before operation. He is placed on an operating table in a quiet side room. The head and eyes are now covered with a sterile towel. The skin of the neck, chin, and supra sternal

its midportion. Here the large superficial cervical nerve (*nervus cutaneus colli*) (Fig. 410) arising from the second and third cervical nerves passes transversely across the sternomastoid

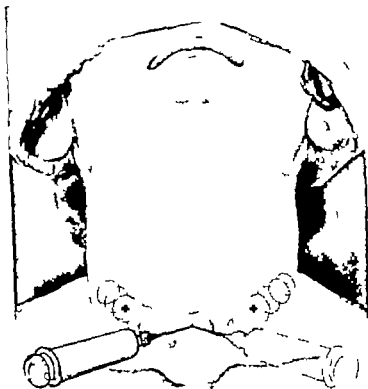


Fig. 409.—Intradermal and subcutaneous infiltration of the procaine solution along the proposed Kocher collar incision. The entire infiltration may be performed through three needle puncture wounds.

muscle to reach the anterior triangle under cover of the platysma and the external jugular vein. It divides at the anterior border of the sternomastoid muscle into superior and inferior branches supplying the skin of the anterolateral surface of the neck from

skin-flap incision, *i.e.* the usual 'Kocher collar incision'—the method of infiltration analgesia (Fig. 411)

2. By injection of the solution into or adjacent to the site of the nerve trunks supplying the operative field—regional

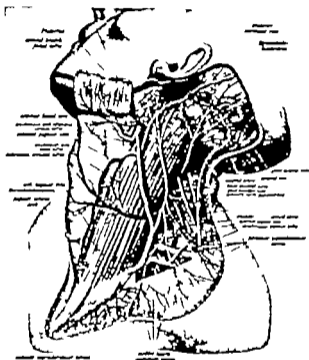


Fig. 403.—The cervical plexus (after Sobotta and McMarrich). The large superficial cervical nerve (*nervus cutaneus colli*) arises from the second and third cervical nerves and passes transversely across the sternocleidomastoid muscle at about its midpoint. At the anterior border of the muscle the nerve divides into superior and inferior branches, supplying the skin of the anterolateral surface of the neck from the chin to the suprasternal region.

anesthesia or nerve-blocking. The cervical plexus (Fig. 408) of nerves on each side of the neck is blocked by passing the long blunt needle on the base of the finger through the skin down to the posterior border of the sternocleidomastoid muscle about

patient's head to the opposite side, thus tensing the fibers of the sternomastoid. Pressure with the finger along the posterior border at about the midportion occasions distinct pain when the nerve is impinged on.

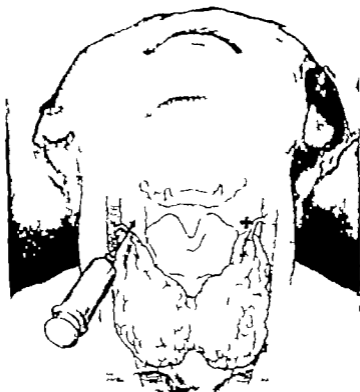


Fig. 411.—Infiltrating the carotid pockets to block the sympathetic fibers covering along the superior thyroid arteries into the upper poles of the thyroid gland.

The sympathetic nerve-fibers supplying the thyroid gland arise from the middle and inferior cervical ganglia and pass along the thyroid arteries. Accordingly it is important to infiltrate

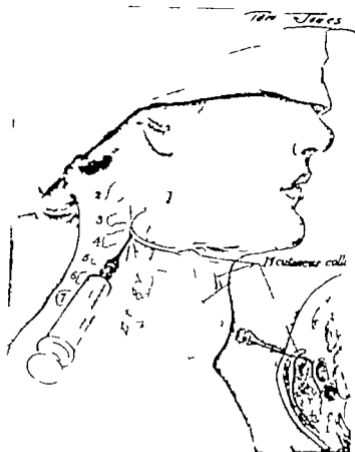


Fig. 410.—Blocking the nervus cutaneus colli at the posterior border of the sternomastoid muscle. The exact location of this nerve is accurately determined by rotating the patient's head to the opposite side thus tending the fibers of the masseter muscle. Pressure with the finger along the posterior border occasions distinct pain when the nerve is impinged on. The insert shows cross section of the neck at the level of the nerve. Note that the thick belly of the sternomastoid muscle adequately protects the deep circle of the carotid sheath.

the chin to the suprasternal region. The exact location of the nervus cutaneus colli is easily determined by rotating the

It is, however, well to bear in mind the fact that patients usually experience a transitory choking or sensation of suffocation when the lateral lobes are luxated or manipulation in enucleating the lobes occasions pressure on the trachea. Aside from this transitory discomfort the patient commonly offers the information that the operation was painless even in the largest types of goiters.



Fig. 413—Patient with toxic exophthalmic goiter. Subtotal thyroidectomy under local anesthesia to protect the myocardium and central nervous system.

An analysis of the case histories of 101 thyroidectomies (Fig. 412) performed under local anesthesia shows that 28 of the patients had radical operation for primary exophthalmic goiter (Fig. 413). With few exceptions the typical case gave a history of slight thyroid enlargement associated with mild toxic symp-

the two pockets at the upper poles of the lateral lobes in the region of the carotid triangles (Fig. 411). To insure complete blocking relatively large amounts of solution must be injected into the sites designated in the accompanying illustrations. Because tactile sensation may occasionally persist although the loss of pain sensation is complete we might employ the term analgesia in preference to anesthesia.

Group I			
Primary exophthalmic goiter (hyperplastic toxic)	Mild		6
	Moderately toxic		9
	Extremely toxic		14
	Number of patients		29
Group II			
Toxic adenomata	Degenerating colloid adenomata		40
	Subterminal adenomata		0
	Subcapsular adenomata		7
	Intrathyroidal adenomata		2
	Fetal adenomata		2
	Number of patients		51
Group III			
Simple colloid goiter (hyperplastic non-toxic)	Number of patients		27
Group IV			
Solitary carcinoma	Number of patients		1
Total number of thyroidectomies (nerve blocking)			104
Operative mortality (percentage)			0 deaths

Fig. 412—Analysis of 107 subtotal thyroidectomies performed under local anesthesia.

The operative field is now prepared with 3½ per cent. tincture of iodin, sterile towels arranged and the head of the table elevated to an angle of 45 degrees. Analgesia is complete within five minutes, so that delay is not desirable as when using the adrenalin in the solution. The anesthesia persists for periods varying from one to two hours, allowing far more than ample time for the most difficult case. We have seldom found it necessary to make an additional injection of the solution after the operation is begun. The entire operation is absolutely painless.

est was nineteen years of age the oldest, fifty-one years. Rest in bed and preliminary medical treatment was instituted in all the severely toxic cases prior to operation. Three patients had double ligations preliminary to lobectomy. Six hyperplastic toxic goiters had a secondary radical operation for recurrence of symptoms coincident with compensatory hyperplasia of the thyroid gland. Four of these patients had received the primary operation elsewhere. 13 patients had chronic disease of the tonsils with tonsillectomy. In 6 instances the tonsils had been previously removed. Among the remaining 9 patients the tonsils appeared normal.



Fig. 415—Thyroid gland of patient shown in Fig. 414. The largest colloid goiters and even the subterminal adenomata may be painlessly removed if the anesthesia is carefully done.

Early operation is essential in treating these toxic patients, since with each crisis additional damage is inflicted on the heart and nervous system, until finally the patient, even though cured of the goiter is left permanently wrecked from the secondary degenerative processes. The operative risks in this class of patients Plummer states are evident largely in the case of patients who have been hypertrophied more than a year.

The group of 49 toxic adenomata (Figs. 414-415) present relatively typical histories and form a large and interesting class of goiter patients. In contrast with the exophthalmic goiter the onset is insidious and the patient states that the goiter was

toma extending over a period of several months. The onset was sudden and gradually the thyrotoxicosis increased up to the latter part of the first year when a crisis developed. Six of these patients were classified as mild 8 were moderately severe and in 14 cases the disease was associated with exophthalmos, tremor weight loss excessive sweating and vasomotor phenomena.



Fig. 414.—Large colloid adenoma removed painlessly under local anesthesia

together with tachycardia and varying degrees of involvement of the myocardium and central nervous system.

This group consisted of 26 females and 2 males. The average duration of symptoms was one year—the earliest at weeks and the longest two years.

The average age of the patient was thirty years. The young

CLINIC OF DR. JOSEPH B. DELEE

CHICAGO LYING-IN HOSPITAL

ACUTE APPENDICITIS IN PREGNANCY AT TERM

Summary Report of 2 cases of acute appendicitis in pregnancy at term. Differential diagnosis between appendicitis and other abdominal lesions. Treatment to be employed. Obstetric conduct of the case where appendicitis occurs in the eighth and ninth months of pregnancy. Mortality of appendicitis in pregnancy.

Acute appendicitis is met during pregnancy with probably no more than usual frequency. In the last few weeks of gestation and during labor it is very rare. I have had one instance of it in thirty years of my private practice, and 3 other cases in consultation occurring in very late pregnancy. Two of these 4 cases will be reported here for the first time.

Case I—Mrs. S., physician's wife, aged twenty-three, primipara. Her previous history was inconsequential except that she was of somewhat hysteroneurotic temperament. She was operated during the fourth month of pregnancy for a simple non-infected mucous cyst of the Bartholin gland. It was done under novocain, without trouble. Nine hours later during a violent coughing attack a hematoma of large size suddenly developed in the labium majus extending upward alongside the vagina for 4 inches. Under ether the bleeding vein was tied and the cavity packed (because of oozing). She made an uneventful recovery.

Labor was expected May 13, 1920. On May 8th at 6 A. M. the patient complained of epigastric pain, which increased in intensity and was soon followed by vomiting. At noon she entered the hospital. Her pulse was 92, temperature 97° F. and respiration 20. The first examination showed a sick woman, not hysterical, with a pulse of 72, temperature 98° F. and respira-

present usually several or many years before the onset of toxic symptoms. This class comprises 46 females and 3 males. The average age was forty two years. The youngest patient was twenty and the oldest sixty two years. The average duration of the goiter was noted to be eleven and a half years. Two patients had goiters for thirty years before toxic symptoms supervened. The average duration of toxic symptoms was one year—the longest three years and the shortest two months before operation.

Seven of these patients had subaternal or subclavicular adenomas. In 2 cases operation revealed an intrathoracic adenoma which was removed under local anesthesia without severe hemorrhage and the cavity was immediately lightly packed with gauze before rupture of the pleura and pneumothorax could result. In both instances the anterior group of neck muscles were hypertrophied presumably as Lahey has pointed out, to guide and direct the adenoma downward through the superior thoracic aperture. The diagnosis of intrathoracic goiter rests largely on the history of respiratory obstruction combined with a widening of the upper sternal shadow in the roentgenogram and frequently a lateral bowing or deviation of the trachea.

Of the 27 hyperplastic non-toxic colloid goiters operative treatment was sought for relief of dyspnea, dysphagia, sensations of pressure on the trachea or as in several cases for unsightly tumefaction of the neck. There was one instance of subacute strumitis.

All patients are given liquid nourishment by mouth immediately after operation permitted to sit up on the second day and discharged from the hospital at the end of one week. There were no deaths in this series of 107 consecutive thyroidectomies under local anesthesia.

In conclusion we would emphasize the fact that local anesthesia is essentially the method of choice in all toxic goiters and its advantages over ether anesthesia are many. Further more the treatment of by far the larger number of toxic goiter patients is surgical and the best treatment consists of early operation at a time before the myocardium, nervous system, and other vital organs are permanently damaged.

many mistakes have been made in confounding one with the other

There remained the gall-bladder the appendix and the obstruction. Even though the pains did not come in colicky waves and run through the body to the back and up into the shoulder—qualities which are usually found with cholecystitis—the gall-bladder was kept in mind. The absence of fever and the quiet pulse (72) permitted us to await developments.

During the afternoon the vomiting was repeated twice. In the evening the temperature rose to 100° F the pulse 104 and the patient felt chilly. The white blood count showed 9000. The pain and the spot of greatest tenderness now became localized near the right uterine cornu. The distention had not increased and the vomiting had ceased, wherefore obstruction of the bowel was ruled out. When the patient took a deep inspiration the pain began only at the end of it, and tapping pressure on the gall-bladder was less painful than over the appendix.

When at 10 P. M. the temperature rose to 101.2° F the white blood-cells to 11,999 and the pulse to 110 a positive diagnosis of appendicitis was made.

Eighteen hours after the onset of pain the abdomen was opened. The incision because of the large uterus and the location of the pain and tenderness, was made much higher than usual namely about half way between the usual gall bladder and appendix areas. It had to be 6 inches long. The tube and ovary were normal but the peritoneum was deep red, and a small amount of cloudy serum was already present. The cecum was raised very high and pushed into the flank by the large uterus.

After much trouble (because of the immense uterine tumor) the appendix was found. It was alongside the spine with its apex pointing to the hilum of the right kidney with a short fat, inflamed mesentery. It was 5 inches long as thick as one's little finger deeply reddened, covered with plastic exudate and two areas on it had necrosed but not perforated. The large uterus was held to the left by means of a large Deaver

tion 22. An enema had been given, with the result of a considerable amount of feces, a small amount of mucus, and very little flatus. A catheterized specimen of urine 6 ounces, showed a very heavy trace of albumin, no casts, no pus, no ureteral elements, epithelium. Blood-pressure 116/60. The heart and lungs, skin, tongue, organs of special sense, and reflexes were negative. The abdomen was much distended; child was estimated a large one—cephalic presentation, O. L. A. There was general tenderness all over the belly, but the patient complained of pain mostly in the epigastrium. Later in the afternoon the pain diminished over the stomach and localized high up in the right side. The tenderness was found over the epigastrium and just below the location of the gall-bladder extending downward to the level of the navel. Pressure on the left side of the uterus evoked pain on the right side of the belly midway between the ribs and the level of the navel, and here was the point of greatest tenderness. There was but slight difference in the abdominal rigidity on either side, but the muscles favored the right, if any. There was no pain to be elicited in either kidney or the ureters—however pushing up the kidney caused pain at the point mentioned before. The stomach was distended with gas. Labor-pains were not present and there were none of the symptoms or signs of any obstetric complications: *e. g.* *abruptio placentae*, rupture of the uterus, ectopic gestation, nor any indication of intra-abdominal hemorrhage.

The diagnosis lay between acute appendicitis, an acute gall-bladder salpingitis, pyelo-ureteritis, and intestinal obstruction.

The type of onset of the disease, the absence of fever, the unilateral location of the pain and tenderness, the negative history (no gonorrhea, no influenza, etc.) the evidently severe attack pointed away from salpingitis, while the same findings and the negative result of urine analysis and kidney and ureteral palpation eliminated the latter organs. I would like to stress the point of differential diagnosis between ureteritis, stone or ureteral kink, and appendicitis. It is usually not easy and

At 2 P. M. the temperature was 98.6° F. pulse 100 respiration 24 not abnormal but the patient had begun to vomit and the pain had increased markedly. There was excessive tenderness over the whole right side of the uterus.

At 5 P. M. the belly was opened with the usual flank incision but longer and a little higher. Seropus was present and the enlarged red necrotic appendix came at once into view. The uterus was held to the side with a liver retractor. In delivering the appendix it burst, emitting some acrid foul-smelling pus. It was as thick as the index finger the cecum was also thick and edematous wherefore it was impossible to bury the stump. A gauze drain covered with a rubber glove was led down to the cecum and the belly closed.

In spite of large doses of morphin labor came on the next afternoon. In one hour the child was born a girl weighing 6 pounds deeply narcotized. There was no hemorrhage. About six days later a fecal fistula developed otherwise the recovery of both mother and child was undisturbed. The fistula closed spontaneously in a few weeks.

Many hours could be consumed discussing the various aspects of these 2 cases but we will be limited to those which are most important from a clinical point of view.

First and foremost here as always, diagnosis is the thing. In describing the cases we went thoroughly into this. A few general remarks may not be out of place.

Whenever a pregnant woman develops a complication the first question we ask ourselves is: Does this complication belong to the pregnant state or is it surgical or medical? In other words: Is this a disease incidental or accidental to pregnancy? A recent experience in consultation will explain my meaning.

A woman was delivered at the eighth month of pregnancy by accouchement forcé the indication being hyperemesis gravidarum. She had vomited almost continuously for ten days and did not improve after the uterus was emptied. Upon examination the vomitus was found to be fecal, and the distended gut could be seen in peristaltic hyperaction leading to the right iliac fossa the site of her appendix operation years

Liver retractor covered with a lap.-pad the appendix removed, and the stump inverted into the thick cecum, using fine silk. The abdomen was closed as usual in clean appendectomies, without drainage.

Morphin and scopolamin were administered to stop uterine action as we wished labor delayed as long as possible.

Recovery was uneventful, but on the fifth day labor-pains began. Dilatation was complete in five hours, whereupon ether was administered to stop bearing-down efforts, a deep perineotomy done, and the child delivered by forceps. There was a smart uterine hemorrhage which necessitated the removal by hand of thick edematous decidua and retained membranes. The uterine wall was edematous. Emptying the uterus, together with ergot and pituitrin failed to control the flow of blood and therefore the uterus was firmly tamponed. The perineotomy was repaired as usual.

The baby weighed 8 pounds. On the second day after the removal of the gauze there was a gush of clear fluid from the uterus evidently blood-serum. It seems that the uterus took part in the general inflammatory intra-abdominal conditions. Mother and child made a perfect recovery.

Case II.—Mrs. P. about eight and a half months pregnant, para II entered hospital with indefinite abdominal pains, said to be labor-pains. Her temperature was 97° F pulse 100 respiration 22. After admission there was good bowel movement with enema. During the night the nurse recorded uterine contractions of moderate strength every three minutes. Early the next morning patient vomited freely the pulse had risen to 120 the temperature was 98.8° F and the woman complained of a severe pain in the right side. A catheterized specimen of urine showed a trace of albumin no sugar no casts, no pus, no ureteral elements. I saw her for the first time at 11 A.

The only difference from the other one that this case presented was the sharp localization of the pain and tenderness, both of which were in the classical area for appendicitis—perhaps a few inches higher than usual. The white blood-cells were 14,250 blood pressure 128 0.

fold. Gangrene and perforation are more rapid. The peritonitis is more wide-spread and more virulent, the reactive forces are less strong, the toxemia more often fatal. Protective adhesions are less likely to be formed, the omentum and gut being pushed away by the enlarging uterus. The inflammation is more stormy owing to the intense vascularity of the parts. Thrombosis and phlebitis are more common. Suppuration takes place higher in the abdomen (true of late pregnancy) which portion is recognised to be less resistant. Drainage is less free owing to the large uterus near by and the abscesses burrow deeply in all directions. Tympany compromises the respiration sooner. Also pneumonitis and pleurisy—obstructive symptoms arise earlier and the bacteria floating in the blood may accumulate in the placenta and even the fetus causing abortion and sepsis. The mortality in the early months (while greater than the mortality of non-pregnant cases) is not as high as after the seventh month when it may be as bad as 40 per cent.

Whether or not the presence of pregnancy should alter the surgical treatment of the case is a disputed point, and no one operator has enough experience in such cases to enable him to make hard-and-fast rules of action.

In a general way it may be said that up to the fifth month the pregnancy gives no indication for an alteration of the usual method of treatment of appendicitis. I have already stated that early operation is the invariable rule, and that while individualization of appendicitis cases in men and in the non-pregnant state, as to operation or expectancy may be permitted to an acute and experienced observer during pregnancy even in cases of doubt it is better to operate.

The location of the incision in the first five months also is the same as usual. I prefer the right pararectal incision for appendix operations in women. One can, if necessary do something to the tube and ovary on the other side, and hernia does not often follow it.

It is best to remove the acutely inflamed appendix if at all possible. Cases are very rare in which one may not spend the few extra minutes in searching for the appendix. Naturally

before. Laparotomy revealed a double kink of the bowel at this point. The patient recovered from the operation. This woman had a purely surgical complication. The fact that the vomiting did not cease after the uterus was emptied indicates that in all probability the pregnancy had nothing to do with the acute intestinal obstruction. At least the complication was one which a man could have had.

Another case will illustrate the reverse of this picture. Dr J B Murphy of sainted memory referred to me a case that had been sent to him as one of acute intestinal obstruction. The woman had been vomiting continually for over two weeks. At that time Dr Murphy was making routine Abderhakken tests and the fact that this patient showed a strong positive reaction led him to make a vaginal examination whereupon he discovered the pregnancy. It was a true ultimately fatal, hyperemesis gravidarum. Had the toxic condition been early discovered this life might have been saved.

In the 2 cases of appendicitis it was easy to eliminate diseases incidental to lat pregnancy. Eclamptic toxemia sometimes begins with vomiting and epigastric pain, but in neither of these women were there any urinary findings, or high blood-pressure or excessive exaggeration of the reflexes, or edema, or any of the usual symptoms and signs of toxemia. Torsion of the uterus rupture of the uterus *abruptio placentae* ectopic gestation, all diseases incidental to pregnancy were easily ruled out—their classic symptoms were absent. It was plain that we had to deal with a disease accidental to pregnancy. It is not necessary to repeat how we decided which one it was—we developed this point in the case histories.

After the diagnosis is made the next thing to do is to decide on the course of treatment. In view of the bad prognosis of appendicitis in pregnancy this rule should be observed. Operate as soon as the diagnosis is made and make the diagnosis as early as possible.

It is generally conceded by those who have studied the subject—Murphy McArthur Schmid Wagner *et al*—that the pregnant state aggravates the dangers of ppendicitis many

obstetric conduct of the case. In the 2 cases cited the following plans were considered: 1 Remove the appendix, close the belly, give morphin to prevent the coming of labor. 2 Remove the appendix after doing a classic cesarean section. 3 Do a low extraperitoneal cesarean section, close the incision, then remove the appendix. 4 Porro-cesarean and appendectomy.

Vaginal cesarean section and induction of labor with delivery from below were not entertained at all, as in both cases the local conditions were not favorable.

Porro-cesarean was not selected in either case because (1) the women were young and should not have been mutilated (2) the appendicitis was early diagnosed (eighteen and thirty hours) and presumably there was little pus and general peritoneal infection (3) there are not enough cases reported to justify this heroic measure in such mild conditions.

The low extraperitoneal cesarean suffers from the same lack of precedent, but it appealed strongly to me. Had labor been in progress for several hours, so that the lower uterine segment was distended and retracted upward away from the bladder—conditions which made the cervical operation easier—this method of treatment would certainly have deserved more favorable consideration.

The classic cesarean section followed by appendectomy was at once dismissed as too dangerous. We know that in the very early stage of appendicitis, even when we find a little seropus around the cecum, that the bacteria have not yet invaded the peritoneal cavity. Bacteriologic examination of this seropus is negative. After gangrene has set in, and indeed sometimes before rupture has occurred, the peritoneal exudate is infectious and always, of course, after rupture. We know that it is very dangerous to open the full term uterus in the presence of pus. Indeed, when we have to do this it is considered good surgery to remove the uterus. Therefore, since we cannot know when the peritoneum is sterile, it is wise not to open the uterus before or after appendectomy. If we can do the cesarean extra-peritoneally it is a different matter.

In the discussion of the selection of the mode of delivery—

If there is extensive general peritonitis, and the woman's condition is grave one should only open and drain freely.

As regards drainage we are using this less and less, following the trend of the general surgeons. We are discussing cases before the sixth month, and the changes in the uterus, the peritoneum and the pelvic connective tissues are not so far removed from the normal. We find that we can trust a great deal to the peritoneum, and some surgeons, even after an abscess has formed remove the appendix, swab out the pus, and close the abdomen. Later if the symptoms do not subside, it is a simple matter to reopen the wound to provide drainage. Whether or not it is safe to do this during pregnancy we need more experience to determine. In early pregnancy it is safer than later. In early pregnancy the question of emptying the uterus does not come up. Should however abortion occur in spite of morphin and rest, we interfere as little as possible and favor the spontaneous emptying of the uterus by tamponade, ergoin, and later pituitrin. Manual curetage, because of the necessary abdominal manipulations is replaced by instrumental, and the uterus is not dragged down—all this to prevent tearing of new protective peritoneal adhesions.

The cases occurring during the sixth and seventh months begin to partake of the dangers and technical difficulties of appendicitis in the last trimester and require more drastic treatment. Operation as soon as the diagnosis is made is the rule. The incision is made a little higher and more in the flank than usual. The large uterus is a little more in the way and requires care in handling (to void abortion). The appendix should be removed (unless inaccessible). I believe one may not trust as much to the powers of the peritoneum therefore one will drain oftener than in the last-mentioned class of cases.

The question of emptying the uterus does not arise in the sixth month. It may in the seventh month, and will be discussed in a few moments.

Appendicitis in the eighth and ninth months gives the largest number of problems to solve because here together with those of a purely surgical nature, we have those of the

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In the discussion of the selection of the mode of delivery—

c g whether vaginal or abdominal—adjuvant conditions must be consulted—*i e* contracted pelvis, primiparity or multiparity the state of the cervix, the strength of the mother etc.

Finally we come to the method actually adopted and you must admit the end justified the course of procedure. In the first case we did not drain and the wound healed by primary union. Perhaps we might have done a cesarean here with safety—and perhaps not. Labor did not come on for five days, and therefore the peritoneal adhesions must have been quite firm and the local immunities well developed because, in spite of the fact that I had to remove the placenta manually and pack the uterus, all this manipulation was followed by no signs of peritonitis.

In the second case the gangrenous appendix burst in my hand and the thick sodden cecum prevented proper management of the stump. I drained with rubber-covered gauze which the event proved was a good measure because fecal fistula resulted. Labor came on the next day but since the abscess was well drained the excursions of the uterus did not spread the pus. Fortunately this case did not require any local manipulations.

CLINIC OF DR. HERMAN L. KRETSCHMER

PRESBYTERIAN HOSPITAL

HYPERNEPHROMA OF RIGHT KIDNEY

Summary A woman of sixty-three years presents herself for examination because of hematuria and pain on the right side. Physical examination and laboratory findings justify diagnosis of hypernephroma, which is verified at operation. Discussion of hypernephroma differential diagnosis

We have for operation this morning a woman aged sixty three whose previous history is negative. Her family history is without significance except that her father died of kidney trouble at the age of seventy-eight and one brother died of pulmonary tuberculosis. Her present complaints are *hematuria pain on the right side* and attacks of *asthma*.

Hematuria was first noted in September 1920 and lasted only one day. The second attack occurred shortly after the first and lasted for a week. There was no pain associated with the hematuria. The third attack occurred several weeks later. The blood was mixed with the urine and the urine had a bright red color. At times the patient passed clots. Upon admission to the hospital she stated that the hemorrhages occurred about once a week.

Pain in the right side These attacks of renal colic began about one month ago. The pain begins in the right lumbar region and is sharp, severe and gnawing. It radiates into the right groin and occasionally she has twinges of pain in the right side associated with tenderness.

For ten years the patient has suffered from attacks of *asthma* occurring in the winter. These attacks are associated with dyspnea. The patient coughs up large amounts of milky fluid.

There is slight burning on urination, but no frequency. The patient has not lost weight and thinks she has gained some recently.

Physical Examination.—The patient is a large woman, in apparently good health. Her head and neck are negative except for a few small submaxillary glands on the right side. Her heart is negative. The lungs show a few rales on the first deep inspiration only. The abdomen is negative. There is tenderness over the right kidney, and the right kidney is palpable, apparently slightly enlarged and movable. The extremities are negative and the reflexes are normal. Vaginal examination is negative. Blood-pressure is 168 systolic and 90 diastolic.

x Ray examination for the presence of stone in the urinary tract is negative. *x* Ray examination of the chest is negative.

The two prominent symptoms in this case that interest us are the presence of blood in the urine and the right sided renal colic. In any given case of hematuria two fundamental questions present themselves. The first is to determine the origin of the hematuria and the second is to determine the cause. Hematuria means the presence of an organic lesion in the urinary tract, and if the patient is examined during the time of active hemorrhage the cause for the bleeding can be definitely determined by calling to our aid one or several of the modern methods of urologic diagnosis. Hematuria should never be considered as a passing symptom and without significance as is so frequently done, because if patients are encouraged to consult a physician the first time that blood is noted, the outlook for curing a patient suffering from one of the various lesions producing hematuria would be very materially increased. As it is, the patients are told that the blood has no significance, and are treated with various medications, and finally are sent to the urologist for diagnosis, only to find that they are beyond relief. In a previous analysis of 200 cases of hematuria I found that in about 43 per cent. of the cases hematuria was due to the presence of new growths in the urinary tract. If we add to this the cases in which the hematuria is due to stone

and tuberculosis, the percentage as you will see will run up very high. Our next step therefore, was to resort to cystoscopy and ureteral catheterization.

Cystoscopic Examination—The bladder was perfectly normal, as were the ureteral openings. Ureters were catheterized with out difficulty or obstruction. From the left ureteral catheter clear concentrated urine was obtained from the right bloody urine. Cell counts and cultures were as follows

	Cells	Cultures
Bladder	9 000	Sterile
Right Kidney	21,000	Sterile
Left Kidney	9 000	Sterile

As a result of the cystoscopic examination we are justified in stating that this patient is suffering from a hemorrhage from the right kidney. This finding fits in very well with her clinical symptoms because she has had attacks of right renal colic and also complains of pain in the region of the right kidney. Our next step in this problem of diagnosis was to determine the cause of the bleeding. As the patient is an elderly woman it would seem most likely that she is suffering from a malignant tumor of the right kidney. The right kidney is enlarged and easily palpable and our findings would seem to confirm our provisional diagnosis of tumor. In order to verify our tentative diagnosis of tumor it was thought desirable to carry out pyelography especially as x ray examination for the presence of stone was negative.

Pyelogram—A 15 per cent. solution of sodium bromid was injected into the right kidney pelvis. This showed a filling defect in the upper part of the pelvis and the superior calyx was obliterated. In the upper part of the pyelogram was seen a long narrow collection of sodium bromid. The upper part of the pelvis appeared to be cupped. The lower calices were markedly clubbed. It would appear that this pyelogram was compatible with the presence of a tumor in the upper pole of the kidney (Fig. 416)

From these findings a diagnosis of malignant tumor of

the right kidney probably hypernephroma was made, and the patient advised to be operated upon, which advice was accepted. Before doing the nephrectomy it was thought desirable to cystoscope the patient again and to carry out a



Fig. 416.—Pyelogram showing tumor in upper pole of right kidney

functional test. Phenolsulphonephthalein test showed the following

	Right	Left
Time of appearance	11 minutes	3 minutes
Output first half hour	5 per cent.	20 per cent
Output second half hour	12	30

Having made a diagnosis of right hypernephroma and having advised the patient to be operated upon we will perform a right nephrectomy this morning. As this patient has a malignant tumor the usual oblique lumbar incision will be made and it will be carried far forward in order to insure a large working space. Having divided the muscles, we reach the capsule of the kidney which is divided. The kidney can be very easily delivered as there are no adhesions. In the lower pole of the kidney you see the presence of a very large cyst. From its appearance and the character of its contents, it is probably one of the so-called urinary retention cysts. The pedicle of the kidney can be freed very easily and the peripelvic fat can be freed by means of gauze sponge dissection. There is no infiltration of the kidney pedicle and nowhere can I feel the presence of enlarged glands. I will, therefore, remove this kidney. The ureter can as you see be easily isolated and I will divide it between two artery clamps. The lower part of the ureter is tied with catgut. I will now place a clamp across the renal vessels and a second clamp below the first. I will now remove the tumor by cutting the vascular pedicle with a knife. Catgut ligatures will be placed one between the two clamps and one below the second clamp. There is no bleeding from the pedicle after the clamps are removed. The large cavity that remains I will pack with a small amount of iodoform gauze. The cut muscles will be closed in two layers and the skin with silkworm-gut.

We will open this specimen by cutting the kidney from pole to pole. On section it shows the presence of a tumor the size of a large plum in the center of which are several areas of calcification.

It is evident therefore that our preoperative diagnosis of tumor of the kidney probably hypernephroma, was the correct one.

Hypernephromas are the most frequent of the malignant tumors that are found in the kidney. During the past fifteen or twenty years much has been said and written about hypernephromata. Formerly as you know the literature on kidney

tumors was in a state of chaos and confusion and a perusal of the old-time literature shows many conflicting terms that have been used in describing tumors of the kidney. However since the tumors were described by Grawitz, their relative frequency became apparent at once, and the use of the old terms to describe these tumors no longer abound. There is some question about the origin of these tumors. As you know it was first suggested that they were due to aberrant adrenal rests. Stoerck, however questions this view and Wilson has recently suggested that they be termed "mesoblastomas." Hypernephromata are not always primary in the kidney. Cases have been reported in which the hypernephroma has occurred as a primary tumor in the liver. Hypernephroma may occur in any part of the kidney—in the superior pole, the inferior pole, or in the middle of the kidney. It was formerly thought because of their supposed origin from misplaced adrenal rests that they always occurred in the upper pole. This however we know is not true. Many of these cases occur in the lower pole and in this particular instance the tumor apparently had its origin in the middle of the kidney.

The hypernephromata more than other malignant tumors of the kidney have a tendency to grow into the renal vein. To be sure every large hypernephroma does not show this phenomenon however it is generally believed that hypernephromata tend to grow into the renal vein and spread into the vena cava more often than do other malignant tumors of the kidney. As a result of this extension, edema of the lower extremities may develop. If this diagnosis can be made prior to operation it is at once apparent that operation would be useless in such an instance.

Hypernephromata are one of several types of malignant tumors that have the well known characteristic of producing bone metastases. Not infrequently the patient may have a hypernephroma that has run a symptomless course and the symptoms that bring the patient to the physician are those due to the metastases, namely spontaneous fractures of the bones or the presence of metastases in the skull. Hyper

nephromata also tend to produce lung metastases, and as this patient had a history of asthma with cough this possibility was considered at once and the chest was subjected to careful x ray examination. This failed to show the presence of any thing that could be interpreted as metastatic involvement of the lung. Metastases to the skin may also occur. These skin metastases are apparently of little concern to the patient at first, but because of their increasing size a physician is consulted, who removes the small, innocent looking tumor under local anesthesia. Histologic examination reveals the true nature of the skin tumor and this is the first intimation of the real condition of the patient.

The symptoms of hypernephroma are variable. Hematuria is undoubtedly the most common symptom.

Blood in the urine may be of two types, either gross or microscopic, and while gross blood is not always present, a very definite number of patients upon close questioning will admit that they have or have had attacks of painless, symptomless hematuria. In our patient this symptom was the most prominent of all the symptoms. Not only do these patients have gross blood in the urine, but microscopic blood may be found if a search is made. Not infrequently patients present themselves for examination who have a certain degree of anemia that cannot be explained. If in some of these cases a careful and prolonged search for blood in the urine is made one will be rewarded by finding a small quantity of blood. Even if this is only microscopic, it may be of definite value coupled with other symptoms and signs. Whether or not a patient passes clots will depend upon the amount of bleeding and whether or not the blood has time to clot in the pelvis or bladder. In instances in which clots are passed down the ureter the patients have more or less typical attacks of renal colic. These attacks of colic differ in no way from attacks of colic due to the passage of a stone down the ureter. In our case the patient gives this rather typical history of renal colic. Sometimes the patients complain of indefinite aches and pains in the back. These may be of two types—pain associated with or due to renal colic

and the dull, indefinite pain in the back due to the presence of a tumor

Cases of malignant disease of the kidney may at times show fever. Though this is not a constant symptom, it does occur. I believe that Israel was the first to call attention to the presence of fever in tumors of the kidney.

Urinary symptoms, such as pain, frequency and burning are hardly ever present.

Physical Examination.—Palpation of the kidney nearly always shows some change in the kidney the site of the tumor. In cases in which the tumor is very large there is no difficulty in palpating the tumor. One can usually outline the presence of a tumor in the kidney region. If the involvement is not too extensive the mass may be movable very often, however the mass is fixed. In cases in which the mass is fixed the outlook for doing a complete removal, of course, is not very good in other words, when the diagnosis is easy from the standpoint of palpation the patient's chances for a long life after his operation are not so good, except, of course, in very thin patients in whom palpation is very much simpler and very much easier than in the thick-bellied person who is short-coupled. While palpation gives us definite symptoms in a certain percentage of the cases, it cannot be relied upon alone to make the final diagnosis in all cases. There are cases in which the tumor is small, the belly so thick, and the kidney in such a high position that palpation becomes a difficult procedure. One must then call to his aid additional methods of diagnosis to verify one's suspicions, and I believe that one is justified in stating that the one single agent that gives us more information than any other regarding the presence or absence of tumor is a pyelogram. I do not believe that pyelography is a procedure to be lightly and recklessly employed *ad libitum*. I think if one is going to use pyelography for diagnosis, one should have pretty definitely in view the object that he wishes to attain. Just to do a pyelogram to be doing some thing does not seem to me to be applying to the proper use this very valuable aid. I do believe that in some of these cases of obscure

kidney hemorrhage in which one cannot come to any definite conclusion pyelography is an agent which gives us very valuable and very definite information. I believe at this point it would be a good plan to show you several pyelograms we have made in the past of kidney tumors to demonstrate the findings.

Differential Diagnosis.—As previously mentioned every patient who has hematuria should be handled from the standpoint of determining the origin of the bleeding and its cause. In cases of hypernephroma the lower urinary tract can be very readily excluded as being the cause of the bleeding by means of cystoscopic examination, so that in the differential diagnosis excluding lesions of the lower urinary tract is simple enough. However the fact that patients who have malignant disease of the kidney may also have pathology in the lower urinary tract must not be forgotten for occasionally one sees a patient suffering with enlargement of the prostate gland who also has a hypernephroma. Our chief concern, however in the differential diagnosis is with other lesions of the kidney that produce symptoms that may be produced by hypernephroma including lesions of other viscera.

As a rule a stone that produces profuse hematuria can be demonstrated by means of the x-ray provided the x-ray technic is good and the plates are carefully read. However we know that all cases of stone in the kidney cannot be demonstrated roentgenologically. The possibility of the presence of stone associated with hypernephroma must not be lost sight of. A patient may have both conditions in his kidney or if the x-ray is positive one might diagnose the nephrolithiasis and miss the hypernephroma.

Renal tuberculosis would scarcely be confused with hypernephroma, as the average case of kidney tuberculosis that consults the urologist is an advanced one in which the patient has bladder involvement, and cystoscopically one sees evidences of bladder tuberculosis. This coupled with pus in the urine should lead us to suspect a lesion other than a malignant tumor as renal tuberculosis is more constantly associated with pyuria than a malignant tumor although the fact that pus is present

in the urine does not of itself necessarily exclude a malignant tumor. In doubtful cases a diligent search for tubercle bacilli in guinea-pig inoculations establishes the diagnosis of tuberculosis.

Polycystic disease involves both kidneys, which are enlarged, irregular, nodular and easily movable. Enlargement of the kidney on each side with irregular surface would lead us to suspect polycystic disease rather than malignant disease of the kidney. Malignant tumors primary in both kidneys are very rare and metastases with enlargement of the second kidney likewise are so rare as to hardly enter into the differential diagnosis.

Nephritis may at times offer problems of differentiation but should not be very difficult of solution. A group of cases that are relatively infrequent and yet one sees them from time to time and call for differentiation are the cases of so-called pyelitis follicularis or bleeding pyelitis. These cases as a rule might be excluded by means of a pyelogram.

There are many other causes of kidney hemorrhage. They are rather uncommon and it is in these uncommon and rare cases in which the findings are atypical, it seems to me that one is justified in performing pyelography. I do not believe that if the patient has all the typical text book signs of kidney tumor it is necessary to perform pyelography which, as you know is not entirely free from danger.

Lesions of other abdominal viscera may occasionally call for differentiation in the group of cases in which there is no history of hematuria and in which diligent search for blood is negative. The lesions most frequently met with are those of the gall-bladder, stomach and duodenum. On the left side occasionally one is called upon to differentiate between tumor of the kidney and a lesion of the spleen. In these two groups of cases pyelograms may be a very definite aid in the differential diagnosis.

Treatment.—The treatment of hypernephroma is, of course surgical. Surgical treatment calls for complete nephrectomy which is possible in a large number of instances. Before the kidney is removed however it has always been my plan to

explore as well as possible for the presence of an extension of the tumor outside of the kidney and the presence of metastases in fatty capsule and in the regional lymph-glands. To determine whether or not the tumor has invaded the renal vein is difficult and cannot always be done. I remember well in one instance, after the clamps were applied and the kidney removed the renal vein showed the presence of very large tumor metastases

CLINIC OF DR. DANIEL N EISENDRATH

COOK COUNTY HOSPITAL

THE LYMPHATICS OF THE FEMALE BREAST IN RELATION TO CARCINOMA OF THE BREAST

Summary Presentation of 3 cases of carcinoma of the breast. Necessity of thorough familiarity with the different routes along which carcinoma spreads from the breast proper to the regional lymph-nodes which drain its parenchyma. Under what conditions is an exploration with removal of all lymph-node bearing fat of the sub- and supraclavicular regions justifiable. Five types of lymphatic drainage described by Mornard.

I DESIRE to present today 3 cases of carcinoma of the breast. Two of these were operated upon four years ago and the third one at our last clinic, a week ago.

My chief reason for showing these patients is to emphasize the necessity of a thorough familiarity with the different routes along which carcinoma spreads from the breast proper to the regional lymph-nodes which drain its parenchyma. Of special importance is the tendency for cancer in the upper half of the breast to extend by way of certain lymph trunks to the sub- and supraclavicular lymph nodes.

The first patient was operated by me at the Michael Reese Hospital on April 27 1916 that is, nearly four and a half years ago. At that time she was only twenty-seven years of age. The onset of her symptoms was very sudden in the form of a sharp pain in the right breast, only three weeks before admission. There was no history of any injury or of any inflammatory disturbance. She was unmarried and there was no history of malignancy in her family. I found three very hard nodules in the upper inner quadrant of the right breast. These masses were quite circumscribed and freely movable, but not tender. There were no palpable axillary or supraclavicular lymph nodes. I con-

considered the condition a benign one before operation, but a frozen section was made after excision of one of the nodules. The pathologist reported finding a typical carcinoma, and consequently a radical removal of the breast was done. On account of the development of the primary focus in one of the upper quadrants I felt that we were justified in making an exploratory incision above the clavicle. I had just finished reading the study of the lymphatic drainage of the breast by Mornard to which I will refer in detail later and was very much impressed with the frequency of occurrence of secondary involvement of the sub- and supraclavicular lymph-nodes in primary carcinoma of the upper quadrants of the breast. I removed the fat of the supraclavicular region and was rewarded by finding two lymph-nodes, each the size of a pea both of which revealed microscopically typical carcinomatous changes. These nodes were not palpable before operation. Further microscopic study of the removed breast tissue showed that the changes which were referred to by pathologists as characteristic of chronic cystic mastitis were present in a number of places, and from these areas had developed the carcinomatous nodules in the inner upper quadrant.

I was unable to trace the patient after her discharge from the Michael Reese Hospital, and was greatly surprised when she was admitted to my service in this hospital a few weeks ago (four and a half years after my operation) suffering from widespread intrathoracic metastases but without any evidence of recurrence at the site of the radical breast amputation nor in the supraclavicular region of the operated side.

We will not stop to discuss the question of supraclavicular involvement, but will take it up later in connection with the third case and Mornard's studies.

The second patient is fifty years of age and was operated by me in June, 1916—four years ago. She had first noticed a mass in the left breast six months before. The tumor was hard, nodular and located in the upper outer quadrant. The nipple was retracted and there were adhesions of the skin over the tumor. No enlarged axillary or supraclavicular lymph-nodes could be felt. A radical operation was done and further ex-

amination of the removed breast confirmed the diagnosis of carcinoma. The supraclavicular region was not explored at this first operation, but about six weeks later a small hard lymph node could be felt above the clavicle, and the patient was advised to have a thorough removal made of all of the supraclavicular fat and this palpable node. This was done and the node showed the presence of carcinoma. She was given a series of intensive x ray treatments over both the site of removal of the breast and over the supraclavicular region. Until February

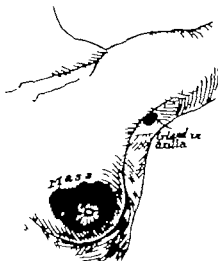


Fig. 417.—Location of carcinoma involving predominantly the upper half of the breast. Note the large axillary glands.

1920 (three and a half years after operation) examination at frequent intervals failed to reveal any evidence of a local recurrence but she has developed symptoms recently referable to the spine and the presence of a metastasis in the body of the fifth lumbar vertebra was confirmed by radiographic examination.

Here again we have no evidence of a spread to the supraclavicular region at the time of the first operation but examination six weeks later showed a lymph-node which no doubt was too small to be felt before the radical amputation of the breast.

The third patient is fifty years of age and noticed a mass in the left breast about one year ago. It had a typical hard, nodular mass (Fig. 417) beneath the nipple. All four quadrants of the breast are involved, but the upper two predominantly (Fig. 417). There is a single hard axillary lymph-node about the size of a walnut, quite fixed on the chest wall. Palpation of the supraclavicular region fails to reveal any enlarged lymph-nodes.

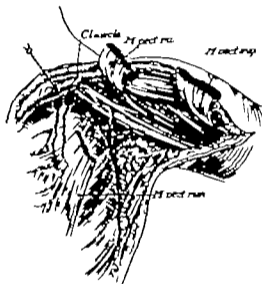


Fig. 418—Appearance of chest wall after division of pectoralis major and minor and removal of all axillary fat and lymph-nodes. The arrow points to the two subclavicular lymph-nodes, each presented on section typical carcinomatous changes. Leading to each one of these was lymphatic trunk also showing typical carcinomatous involvement.

The opposite breast and the corresponding axillary and supraclavicular regions were negative on examination.

A radical operation was done one week ago and we found extensive involvement not only of the lymph-nodes adjacent to the axillary vein but also of those lying on the subscapularis muscle, the removal of which latter lymph-nodes has been so strongly emphasized by the late Dr. W. L. Rodman.

The most interesting finding however was the presence of two carcinomatous lymphatic vessels (Fig 418) lying between the pectoralis major and minor muscles. The firm cords ended in lymph nodes lying just beneath the clavicle and evidently connecting with others in the supraclavicular region, not accessible to palpation. I did not feel justified in a thorough removal of the lymph-node bearing fat of the supraclavicular region because I deemed the case one which was not favorable to a radical cure owing to the wide-spread dissemination which the operation on the breast proper had already disclosed.

These 3 cases bring up the question of how frequently does primary involvement of the sub- and supraclavicular lymph-nodes occur in carcinoma of the breast, and what change, if any is necessary in our radical operation in order to conquer this regional invasion. In other words should we also add a thorough removal of the supraclavicular lymph-node bearing fat when there are no palpable enlargements in this space? On one point I believe we are nearly all of the same opinion, and that is, if there are palpable supraclavicular lymph-nodes not only is the prognosis very grave but radical operation is nearly always contraindicated.

The chief question to discuss then is, Under what conditions is an exploration with removal of all lymph-node bearing fat of the sub- and supraclavicular regions justifiable?

Let me first direct your attention to the most important features of Mornard's investigations on the relation of the lymphatics of the breast. He injected both sides in 50 subjects by the Gerota method and found five types of lymphatic drainage toward the axillary sub- and supraclavicular nodes. These are the following

Type 1 (Fig 419) This is the classical mode of drainage which, however Mornard only found twelve times on both sides in 50 subjects and forty five times in 100 breasts, that is, only 25 per cent of individuals show the anatomic conditions which we have been taught as being present in every female breast. In this classical type 3 to 5 lymphatic trunks leave the

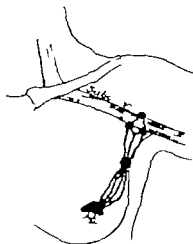


Fig. 419—Three to five lymphatic trunks leave the outer and lower border of the mammary gland and reach the central group of lymph nodes lying on the axillary vein. The first set of relay nodes are shown lying along the outer border of the pectoralis major muscle (after Mornard).

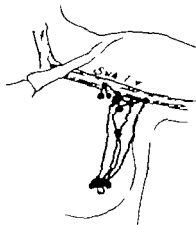


Fig. 420—(Type 2) Lymphatic trunks leading to the humeral chain (outer axillary). In this illustration Mornard shows how the lymphatics from the outer half of the breast lead not only to the center but also to the outer axillary lymph-nodes (after Mornard).

outer and lower border of the mammary gland and reach the central group of lymph-nodes lying on the axillary vein (Fig 419) The first set of relay nodes are those lying along the outer (lower) border of the pectoralis major muscle (Fig 419) When his injections passed beyond these pectoral and axillary nodes the fluid reached the subclavicular or even the supraclavicular nodes, but the injection rarely reached these latter groups by this route

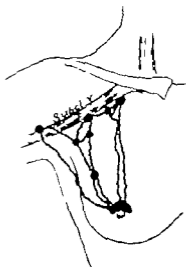


Fig. 421.—(Type 3) Two lymphatic trunks (axillary and subclavicular) One of these proceeds directly to the central axillary group of lymph-nodes, with an occasional relay node along the lower border of the pectoralis major muscle, while the other trunk proceeds directly to the group of nodes lying beneath the clavicle (after Morcard)

Type 2 (Fig 420) I lymphatic trunks leading to the humeral chain (outer axillary) In 12 of 100 breasts an efferent trunk left the lower outer border of the breast and followed the lower border of the pectoralis major muscle to empty into a lymph-node lying on the axillary vein This arrangement coexists especially with some of the other types to be described later

Type 3 (Fig 421) Two lymphatic trunks (axillary and subclavicular) In a large number that is 27 of 50 subjects on both

sides (a little over 50 per cent.) and 35 of 100 breasts, Mornard observed two trunks. One of these is the classical one described as Type 1 (Fig. 419) which leaves the outer lower portion of the breast and leads to the central axillary group of nodes with an occasional relay node lying along the lower border of the *pectoralis major muscle*. The other lymphatic trunk is formed by two or three smaller ones which leave the upper and especially the upper inner portion of the breast. These trunks

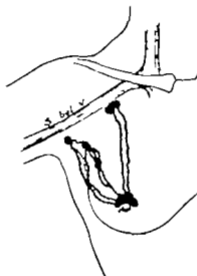


Fig. 422.—Complete independence of the lymphatic trunks leading to the axillary and subclavicular lymph nodes respectively (after Mornard)

(Fig. 421) proceed directly to the group of nodes (subclavicular) lying beneath the clavicle and pass upward beneath the *pectoralis minor* near its costal insertions. When this type is present a single barrier formed by the subclavicular nodes (Fig. 421) separates the breast from the supraclavicular lymph-nodes. In 20 cases Mornard found a complete independence of the two territories axillary on the one hand and subclavicular on the other (Fig. 422). This frequent arrangement (35 in 100 breasts) seems to explain the rapidity of invasion of the subclavicular

nodes so often found in cancers of the upper inner portion of the breast.

Type 4 Lymphatic trunks between the two pectorals. This closely resembles the third type but the trunk to the subclavicular nodes passes between the pectorals major and minor muscles. This is the trunk which I was able to demonstrate at operation in our third case (Fig 418) of today's clinic.

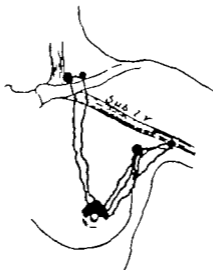


Fig 423—Lymphatic trunks leading separately to the axillary and subclavicular spaces and lymph-nodes (see text). This direct route to the subclavicular region explains how early invasion of this region may occur especially in cancers of the upper inner quadrant (after Mornard).

Type 5 (Fig 423) Lymphatic trunks direct to the supraclavicular nodes. Mornard only found this in 3 of 100 breasts, but it is of great clinical importance. A lymphatic trunk leaves the upper inner portion of the breast and ascends (either between the two pectoral muscles or beneath the minor) to the clavicle (Fig 423) passing between the subclavian artery and vein to the supraclavicular nodes. This route explains how the axillary nodes may as in our first case be omitted and an early invasion

of the supraclavicular nodes occur especially in cancers of the upper inner quadrant.

The topography of the supraclavicular lymph nodes is of great importance in connection with the question of whether or not a removal of the lymph-node bearing fat of this region shall be done in cancers of the upper half of the breast. The nodes occupy (Fig. 424) the triangle between the internal jugular and

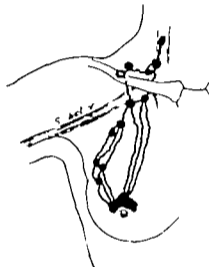


Fig. 424.—Topography of lymph-nodes of the sub- and supraclavicular region, showing how carcinoma travels from the breast to the sub- and supraclavicular regions directly without need of involvement of the axillary lymph nodes. In the supraclavicular region are seen two sets of nodes described by Mornard, namely the internal and external (after Mornard)

subclavian veins and omohyoid muscle. Mornard found two sets of nodes, (a) an internal and (b) an external. In some cases these are combined. The internal group consists of one or more nodes lying in the angle (Fig. 424) between the internal jugular and subclavian veins beneath the outer border of the sternomastoid muscle. These are the seat of election for recurrences in the supraclavicular group.

The external group is less often met with. They are found in

the lower outer angle of the triangle formed by the subclavian and internal jugular veins and the omohyoid muscle (Fig. 424). In general there are two to three nodes of which the most external can reach the trapezius muscle. When both internal and external groups coexist each drains into its own territory. The nodes of the two groups can be united by lymphatic trunks but more often they remain separate.

My reasons for quoting these investigations of Mornard are first, that they explain many of the cases in which the first evidence of a recurrence is in the supraclavicular nodes and second that the question arises as to whether or not we should add a thorough removal of the lymph node bearing fat of the supraclavicular region to our radical operation as it is performed by the majority of surgeons at the present time. I am not yet convinced of the necessity of this as a routine procedure. Of one thing I am certain however and that is, in cancers of the upper half of the breast, as in our 3 cases (especially in those of the upper inner quadrant) we should remove all of the fat and other tissues as far up as the clavicle and if possible to the subclavian vein itself.

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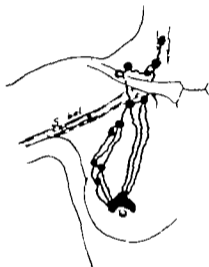


Fig. 424 —Topography of lymph-nodes of the sub- and supraclavicular region, showing how carcinoma travels from the breast to the sub- and supraclavicular regions directly without such involvement of the axillary lymph nodes. In the supraclavicular region are seen two sets of nodes described by Mornard, namely the internal and external (after Mornard).

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My reasons for quoting these investigations of Mornard are first, that they explain many of the cases in which the first evidence of a recurrence is in the supraclavicular nodes and second that the question arises as to whether or not we should add a thorough removal of the lymph-node bearing fat of the supraclavicular region to our radical operation as it is performed by the majority of surgeons at the present time. I am not yet convinced of the necessity of this as a routine procedure. Of one thing I am certain however and that is, in cancers of the upper half of the breast, as in our 3 cases (especially in those of the upper inner quadrant) we should remove all of the fat and other tissues as far up as the clavicle and if possible to the subclavian vein itself.

A CASE OF UMBILICAL FISTULA

Synopsis History of purulent discharge from umbilicus for one month before admission to hospital. Abdominal findings at operation confirmed working diagnosis of tuberculous peritonitis as cause of the umbilical fistula. Discussion of various possible sources of such condition.

You will probably recall a case of tuberculosis of a hernial sac which I presented at a recent clinic and the discussion of the multiform pictures under which the various forms of abdominal tuberculosis masquerade.

Our first patient today is another example of the protean manner of occurrence of this form of infection. A fairly well developed young woman of twenty two entered the hospital a week ago complaining of a purulent discharge from the umbilicus. She felt perfectly well until six months ago when pain was experienced on both sides of the abdomen, which gradually decreased in severity during the next four months. About three months ago she noticed a swelling over her umbilicus, which became quite painful about a month ago. The umbilical protrusion increased gradually until ten days before admission to this hospital, when the discharge of a pint of pus occurred spontaneously from the umbilicus. This discharge has continued to the present time. Her family and personal history fail to give us any data as to a possible cause for the umbilical suppuration. Aside from slight discomfort from some abdominal distention during the past three months there have been no symptoms referable to the alimentary canal. She has lost about 25 pounds during the past seven months and has had night-sweats for two months. There is no history of pelvic trouble or chills jaundice or of urinary disturbances.

Since entrance about one week ago her temperature has ranged from 99° F in the morning to 101° F at night. There is a slight leukocytosis and the examination of the urine reveals nothing abnormal.



Fig 423

Let us first inspect the abdomen. Corresponding to the normal location of the umbilicus is an opening whose edges are everted and lined with pale, flabby granulations. Note the thick pus which escapes from this opening. The abdomen is moderately distended and seems especially prominent just above the region where the umbilicus would be located in a normal individual.

On palpation there is a distinct resistance corresponding to the supra-umbilical prominence. This tumor is nodulated, firm, about the size of the palm of the adult hand, and located just beneath the abdominal wall—that is, within the peritoneal cavity.

In the clinic on abdominal tumors¹ I called attention to an important differential point between tumors located in the abdominal wall itself and those lying beneath it, namely that in the former the tumor becomes more prominent when the patient is asked to sit up while if the tumor is intraperitoneal it becomes less prominent and cannot be felt when the patient sits up. This test shows that the tumor in our present case although attached to the abdominal wall is evidently an intra-abdominal one. Percussion fails to reveal any free fluid the only area of dullness being that over the supra-umbilical tumor. Bimanual vaginal as well as rectal examination do not reveal any abnormal condition.

I am of the opinion that we are dealing with an umbilical fistula due to the spontaneous rupture of an intraperitoneal abscess of tuberculous origin. This working diagnosis is based on the history of diffuse abdominal pain and loss of weight during the past six months, and especially by our finding the nodulated intraperitoneal mass adherent to the abdominal wall just above the discharging umbilicus.

Fig. 423—1. Shaded area represents the extent of the palpable mass in the center of the shaded area is the umbilical fistula. The black line below the fistula represents incision made to explore abdominal cavity. 2. Detailed drawing of appearance of umbilical fistula. 3. Nodular tubercles on coil of intestine protruding through incision. 4. Septical view of abdominal wall showing relation of zones of matted tubercles to the umbilical fistula.

The patient having been anesthetized, I will make an incision in the median line just below the umbilicus. Observe the

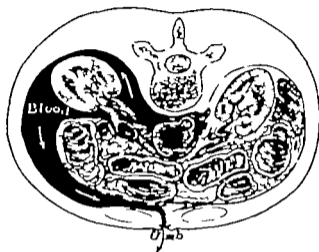


Fig. 426—Diagrammatic representation of how blood may escape from retroperitoneal vessels—umbilicus (after Cullen)

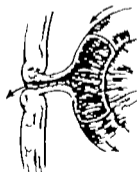


Fig. 427—Patent Meckel's diverticulum opening at umbilicus. Arrows indicate direction of fecal matter.

marked thickening of the parietal peritoneum as first indication of some chronic inflammatory process within the abdomen. This is very typical of the dry forms of tuberculous peritonitis.

Note the large yellow nodule which protrudes from one of the edges of the peritoneal incision. The nature of this nodule is at once confirmed by our finding a large number of similar nodules on the exposed visceral and parietal peritoneum. Some of the nodules are grayish, while others are yellow that is, caseous. The size of the individual nodules averages about

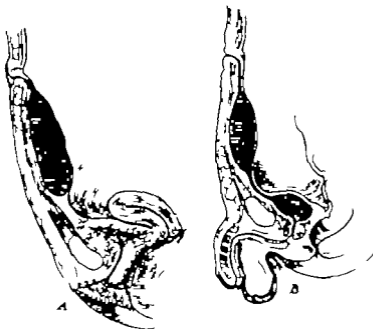


Fig. 428.—A Diagrammatic representation of fistula due to persistent rachis opening at umbilicus (after Cullen). B Diagrammatic representation of persistent urachus opening above the umbilicus and communicating with the fundus of the bladder (after Cullen).

that of a hemp seed. We are evidently dealing with a much more virulent form of peritoneal tuberculosis than that usually referred to as the milary form. This case belongs to the type which I have previously referred to as the nodular or caseous. There is but little free fluid. A probe inserted through the umbilical fistula is felt (when I insert my hand through our opening in the peritoneum) to pass directly into a mass which I inter-

pret as being composed of agglutinated tubercles which have become adherent to the abdominal wall in the vicinity of the umbilicus. The causation of these conglomerate tuberculous masses was undoubtedly the cause of the discharge of pus from the umbilicus a month ago and will continue until the underlying infection subsides.

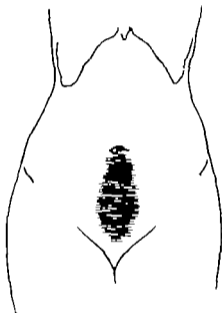


Fig. 429 — Shaded area represents location of pus and induration in cases of inflamed peristomal trachias.

The mass is not the result of a tuberculosis of the mesenteric lymph-nodes nor of a rolled-up omentum as is so often encountered in the form of tuberculosis of the peritoneum.

After closing our median line incision we will enlarge the opening through which the pus has been discharging from the umbilicus in order to provide for better drainage of the caseated tubercles. Within a few days systematic course of x-ray treatments will be begun. Of all the therapeutic measures for

peritoneal tuberculosis this has been found to give the most satisfactory results. The entire surface of the abdominal skin will be divided into a series of squares in order to expose as large a number of areas as possible during the course of these deep x ray treatments. The prognosis in this nodular or caseous type is, in general, less favorable than in the ordinary dry or in the

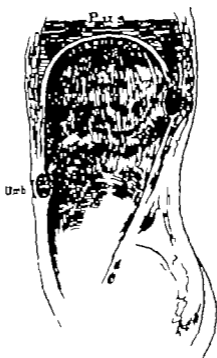


Fig. 430.—Umbilical abscess communicating with pleural cavity (modified from Coffey)

ascitic forms, and it will no doubt require a longer time to see a favorable result in this patient. Just as is the case elsewhere in the body we note a difference in the virulence of organisms in abdominal tuberculosis. The formation of large nodules and caseating masses such as we found at operation today indicates a high degree of virulency and a correspondingly graver prognosis.

A purulent discharge from the umbilicus may be due to a number of causes other than a tuberculosis of the peritoneum. We are indebted to Dr. Thomas S. Cullen for a most valuable contribution on the diseases of the umbilicus and I can warmly recommend his recent book to those of you who are not familiar with a chapter in surgery which has not received as much attention as it deserves.

Fluid whether it be pus, blood, or urine escaping from the umbilicus may have its origin from (1) the retroperitoneal tissues, (2) from the peritoneal cavity and (3) from a patent urachus.

1. *Escape of Retroperitoneal Fluid from the Umbilicus*—Cullen states that blood or pus in the retroperitoneal tissues may by a process of dissection loosen up the peritoneum from the underlying muscular or adipose tissue until the umbilicus is reached and the blood or pus either cause a protrusion at the location or perforate the skin of the umbilical region and be spontaneously discharged.

Cases have been reported where (1) a periprostatic abscess, (2) an empyema and (3) a broad ligament abscess have opened at the umbilicus.

2. *Intraperitoneal Causes*—Cases have been reported under this heading where (1) an appendix abscess, (2) an abscess of the liver (3) a pneumococcus intraperitoneal collection of pus, and (4) a tuberculous peritonitis have been discharged through the umbilicus.

Other intraperitoneal causes for a discharging umbilicus are (1) a patent Meckel's diverticulum, (2) a fecal fistula due to perforation of an adherent coil of small or large intestine.

3. *Escape of Urine or Pus from Patent Urachus*—The urachus may remain open in postfetal life all the way from the bladder to the umbilicus, so that urine escapes from the latter. If the urachus ceases to communicate with the bladder a blind sac persists which discharges its contents at intervals through the umbilicus. If infection occurs the fluid becomes purulent and the local findings are quit similar to

those presented by our patient today. The principal symptoms in cases of infected urachal remains or of urachal cysts are pain and induration in the median line of the abdomen from the umbilicus associated with generalized symptoms such as fever, chills, etc. There are as a rule no bladder symptoms.

Of all of the possible sources of pus discharging from the umbilicus, as in our case we are particularly interested in the tuberculous peritonitis. In children such a complication is not infrequent.

Cullen, from his study of all reported cases of this kind, believes that the fluid reaches the surface by two methods—either by gradual disintegration of the abdominal wall or by distention of the umbilical opening. A local cause such as we found today namely that the discharge is due to the caseation of large tuberculous masses attached to the parietal peritoneum in the vicinity of the umbilicus, is not mentioned by Cullen.

CLINIC OF DR. CARL B. DAVIS

PRESBYTERIAN HOSPITAL

TUMORS OF THE LARGE BOWEL. PRESENTATION OF A GROUP OF CASES ILLUSTRATING TYPICAL AND ATYPICAL PATHOLOGY IN TUMORS OF THE LARGE BOWEL

1 Hirschsprung's Disease in a Child of Six Months Findings at Operation Mortality Exceedingly High in the First Year of Life

2 Chronic Sigmoiditis in a Patient with a Left Inguinal Hernia.

3. Diverticulitis of the Sigmoid Frequently Mistaken for Carcinoma Microscopic Examination of Removed Specimen Necessary to Establish Diagnosis.

4 Peritoneal Tuberculosis in a Patient Operated on Four Years Previously for Appendicitis, with Resultant Fecal Fistula. Excellent Result Obtained by Operation, x Ray Treatment, and Exposure to Sun's Rays.

5 Stricture of the Rectum the Result of a Vaginal Gonorrheal Infection Invading the Rectum Operative Treatment—Resection and Establishment of a Colostomy Superiority of Abdominal Over Sacral Anus.

6. Adenocarcinoma in a Girl of Nineteen with Extensive Gland Involvement. Patient in Good Health Three Years After Operation.

RATHER than cover the entire subject of large bowel tumors, an attempt will be made to summarize a number of interesting cases. The records were chosen because they present both typical and atypical examples of pathology in their groups. Hirschsprung's disease or megacolon a dilatation of the colon rather than an actual new growth, might be included, as the

appearance of the patient is quite suggestive of an abdominal tumor

A true *Hirschsprung's* disease is found in the large gut. Analogous dilatations of the ileum do not rightly belong here. The disease involves at times the entire colon. More frequently it occurs in the sigmoid or sigmoid and descending colon. There is usually an enormous hypertrophy of the musculature of the dilated bowel. In one case however we found a thinned-out intestinal wall, not so heavy as a normal colon. This patient was operated on at about six months of age. During the first month of life he was thought to be constipated merely and the movements were obtained by enemata. At about three months



Fig. 431.—Sketch of the tubular megacolon

of age he showed an enormous dilatation of the abdomen so much so that it was feared he would rupture an intestine before relief could be obtained by flushing. Early relief was given by simple rectal enema, later repeated flushing of the colon was required and finally it required hours of effort on the part of the physician and nurse to reduce the enormous distention caused by feces and gas (Fig. 431). The gas in this case was the predominating feature. The distention would commence and be complete in six hours. The parents brought the child for operation willingly and eagerly as the last two attacks almost resulted in death. On both occasions the baby was exhausted for a number of days. X-ray examination at this time showed considerable quantity of gas in the colon (Fig. 432).

At operation a dilated sigmoid and descending colon were found. The enlargement did not present as a spindle-shaped affair but showed a very rapid transition from normal gut to the diseased portion. The length of the involved intestine was about 8 inches. The baby was very weak, so no effort at primary resection was made. A second incision was made in the

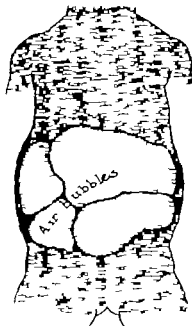


Fig. 432.—x-Ray photograph of baby with megacolon. The plate was made while track was subsiding. Colon at that time contained considerable quantity of air.

left side and the diseased loop with 1 or 2 inches of normal gut was drawn out and fixed in position. After forty-eight hours the loop was resected and a clamp applied to the spur composed of the walls of the adjacent loops of bowel. With the destruction of the spur it was thought that the fecal current would be restored to its normal channel and the case would be closed in the usual manner. As the abdominal wall closed down on the

fistula fecal matter passed by rectum. This normal condition gradually gave way to signs of obstruction. The colostomy was opened under the impression that the spur had not been cut down sufficiently. We did not use a barium enema for diagnosis, as we had had considerable difficulty in getting rid of the enema injected in a previous and somewhat similar case. The spur was found obliterated to what appeared a sufficient degree. Nevertheless, the clamp was applied again to give plenty of space at the site of resection. The colostomy gradually closed again with the same grade of obstruction as before. A lateral anastomosis was then made between the cecum and distal portion of the sigmoid. The child did well at the hospital and was apparently in normal health for a month after returning home. There was a sudden cessation of bowel movements, and at the end of forty-eight hours the colostomy was opened again with the escape of a large amount of feces and gas. A proctoscopic examination of the anastomosis was made and showed an opening large enough to readily admit the proctoscope. Examination of the anastomosis was also made from the colostomy opening. There seemed to be a normal caliber of the gut throughout. Barium was then injected from the colostomy in a downward direction filling the gut to the anal opening. A Ray examination showed a cylindric shadow normal in all respects. This mass of barium was not expelled by the infant. It was necessary to remove it by flushing and digital exploration. For the last five years the bowel has functioned through the colostomy opening. Now that the child is old enough to co-operate a further effort at diagnosis is to be made. At present there is no dilatation of either the ascending or transverse colon, either ascending or transverse. There was no hypertrophy of the wall of the excised section, but rather a thinning out. There was no dilatation in the rectosigmoidal region as might be expected if there were failure of the musculature in the rectum. The failure of the rectum to expel the barium might be due to the lack of continuity with the sigmoid. This same condition was seen in a man who had a colostomy with resection of the rectosigmoidal region for carcinoma leaving the ampulla of the rectum. Mucus would

accumulate in this section producing distress until he learned to flush this segment at regular intervals.

Another child, with the same history of distending abdomen and persistent constipation was found with a sigmoid colon as large as an adult stomach, and with musculature as heavy as sole leather. A comfortable margin for anastomosis was left in the rectosigmoidal region and the distended gut resected. When anastomosis was attempted it was found that the distal stump had contracted beneath the level of the peritoneum. The stump was grasped in forceps and pulled out and an anastomosis made. The union appeared satisfactory and the abdomen closed. The child died within a week. The distal end of the gut had retracted below the culdesac into the pelvic diaphragm and had opened up most of the line of suture.

In this case the longitudinal and circular fibers were greatly overdeveloped, and when cut loose from the upper gut simply pulled down into the sling of the levator ani muscles.

The high mortality (80 per cent.) in the first year and a gradually lessening percentage up to five years of age results in very few of these individuals reaching adult life.

A young man, twenty-eight years old with an abdomen about the diameter of a flour barrel, gave a typical history. He stated that all his life he had had a constipation that could be relieved only by flushing. Cathartics had no effect on him. About once a week he took a number of hours to empty his colon. Each movement consisted of several quarts of material.

After a flushing he was given a barium enema under the fluoroscope. So much material was taken into the bowel and so enormous a shadow was shown that it was feared the patient might be injured. A shadow 10 inches in diameter was obtained (Fig. 433). The man was in poor condition. The legs and arms were thin and he gave the impression of an enormous abdomen having attached to it head, arms, and legs. He reported primarily for an arthritis of the hip. He was not desirous of having the abdomen opened, and no great effort on our part was made to cause the patient to change his mind.

The following history is an interesting example of mistaken

diagnosis. Miss F age forty had been disturbed by a left inguinal hernia for a number of years. The last two years previous to operation the hernia would appear in spite of her efforts to control it by a truss. During the last six months before operation the hernia had been fixed in the groin. She was unable to reduce it. The tumor was becoming more troublesome because of her efforts in her profession which was that of a masseuse

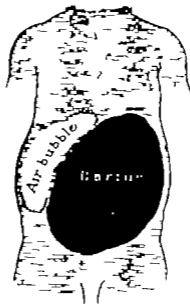


Fig 433—Megacolon in male patient sixty-eight year of age. Sigmoid and descending colon accepted tremendous amount of barium barium given by enema under the fluoroscope

Under ether the hernia was exposed but because of difficulty in reducing it the abdomen was opened by midline incision. After considerable effort the sigmoid was returned to the abdomen. It was then seen that the sigmoid showed tumor mass the size of a fist. The tumor was annular in involving the entire gut irregularly nodulated firm and sharply outlined from normal bowel tissue. The patient had had no bowel distress at any

time, had shown no blood in the stools and had had no disturbance other than that which might be caused by any incarcerated hernia. The abdomen was closed with the intention of doing a secondary operation. Six weeks after operation the patient was referred to our service for a radical removal of the tumor in the sigmoid. Through the old scar the abdomen was opened in the presence of the surgeon who had operated previously. Exploration of the abdomen and entire large bowel showed a normal intestinal tract throughout. There was some slight induration of the sigmoid but the tumor mass had disappeared.

The diagnosis in this case was chronic sigmoiditis. The patient was kept under observation for a year following operation and showed no symptoms suggestive of any further disturbance. This case belongs to one of the groups which are frequently mistaken for carcinoma. Chronic sigmoiditis not infrequently occurs where a loop of bowel is held for a month or years within a hernia.

Diverticulitis of the sigmoid not infrequently has all the earmarks of a carcinoma and not infrequently the patients are given a colostomy with the understanding that their life will terminate in six months or a year. At the end of the allotted time the patient is in full health and strength and fluoroscopic examination of the distal loop will show the mass has gone. This type of case may be the source of some of the marvelous cures attributed to some of the various healing cults. A positive diagnosis should be backed up by the microscope whenever possible.

Mr. F., age twenty-eight, was referred to our service with the diagnosis of tumor of the ileocecal region probably appendiceal in origin. The patient gave a record of irregular colic in the lower right quadrant, some tenderness on pressure and a normal temperature throughout the period of hospital observation, four days preliminary to operation. Leukocyte count was 11,000. Stomach, stool and urinary findings were negative.

Incision in the right flank showed a tumor mass the size of a fist involving the cecum and ascending colon and extending

slightly into the ileum. The appendix was free from the disease, protruding outside the mass for its entire length. No enlarged glands were found in the mesocolon. A diagnosis of tuberculous or carcinoma was suggested. A resection involving the distal portion of the ileum ascending colon a portion of the transverse colon, mesocolon and involved glands was done. A lateral anastomosis of the small bowel and transverse colon was made. The patient made an uneventful recovery. The specimen showed a hypertrophy of the walls of the colon. The greater portion of the bowel wall in the diseased area was approximately an inch thick. Sections of the hypertrophied zone showed no carcinoma and no histology suggestive of tuberculous. The tissue everywhere was simple fibrous hyperplasia with marked round-cell infiltration. A chronic hyperplastic colitis, probably resulting from a diverticulitis at some time was the final diagnosis.

Miss C. age twenty-six years was referred to our service for closure of a double fecal fistula. A brief summary of her history was that she was operated on primarily four years before, for appendicitis. The wound was opened for the second time for abscess formation and a tube inserted. A fecal fistula resulted and persisted in spite of two subsequent operations for closure. Following the last effort a second fistula opened through the midline scar leaving the patient with two fistulae through the midline scar and one through the appendical scar. The patient at this time had dropped to 80 pounds and was bedridden. Efforts to close these fistulae by means of bismuth paste injections failed.

Several months had elapsed between the last operation and admission to our service and it seemed that sufficient time had been allowed for the fistulae to heal over.

An incision through the left rectus parallel with the umbilicus was made in the hope that the lower abdomen could be explored without contamination from the intestinal discharge. In the lower abdomen was found a mass composed of the pelvic organs, large bowel, omentum, and approximately 20 inches of the ileum. Scattered over the viscera and peritoneum were numerous tubercles. There was a moderate amount of free fluid in the

abdomen. The 20-inch section of the ileum was determined by exploration. A uterine sound was carried into the appendical fistula and carried upward through the ascending colon until it could be identified by the hand within the abdomen. The direction of the sound was then shifted until it could be carried through the small gut downward to the openings which were in the midline scar. The sound was then reinserted through the midline fistula and carried through the small gut until it could be pushed into that portion of the ileum which was entering the adhesive mass. The ileum was resected at a point just proximal to where it entered the mass. The ascending colon was resected about its midline. All four openings were turned in. That portion of the ileum which was now lying free in the abdomen was brought up and attached to the transverse colon. Thus we left a tract of approximately 20 inches of ileum and a small portion of the ascending colon in a continuous tract which was isolated from the rest of the intestinal tract, but which communicated with the skin through the fistulous openings in the abdomen. Tissue removed at operation showed the histology of tuberculosis.

As soon as the patient could be moved the abdomen was given x-ray treatments, and later the patient was carried into the sunshine and the entire body exposed directly to the rays of the sun in the manner suggested by Rollier. The browning of the skin was begun by a few minutes exposure of the various parts of the body each day until finally the young woman was sent to the country where it was possible for her to live in the sunshine practically all day with her entire body exposed to the sunshine. In six months she was as brown as an Indian, and had gained 40 pounds. Three years have now elapsed since the patient left the hospital. She has gained 60 pounds and is earning her own living. There is a small daily discharge of mucus from the fistula. This is cared for by a bit of gauze held in place by adhesive tape.

Many persistent, multiple fistulae of the ileocecal region prove to be tuberculous. Good results are obtained by a lateral anastomosis and resection, either primary or secondary.

Mrs. F., age forty-eight years, was referred for operation with the diagnosis of cancer of the rectum. Twenty-five years previous she went through an illness that apparently was a vaginal gonorrheal infection, which later was carried into the rectum. For years after the vaginal discharge had disappeared the rectal affair continued and became more distressing. There was a profuse discharge of pus increasing difficulty in defecation which on admission was rapidly approaching a complete obstruction, and the development of numerous fistulae.

Examination showed numerous fistulae about the anus, some of them opening far out on the buttocks. The anal orifice would admit nothing larger than a urethroscope. Tissue was removed at various levels up to a point that would correspond to 2 inches of the ampulla. A barium enema showed a lumen stenosed to $\frac{1}{4}$ inch extending to the level of the sigmoid. As no malignancy could be found in the tissue removed the diagnosis of benign inflammatory stricture was made.

Through an abdominal incision it was seen that the disease extended to the sigmoid for an inch above the cul-de-sac. The bowel was brought out on the abdomen for a permanent colostomy and the entire distal segment of the large gut resected. The specimen removed showed a massive stricture of the rectum with a radial thickening of scar tissue of an average of 1 inch. The bowel lumen passing through the scar averaged about $\frac{1}{4}$ inch in diameter. A large part of the canal was denuded of mucosa. No malignancy was found.

The fistulae connected with the bowel at irregular levels extending through the scar to the lumen.

Eight years have elapsed and the patient is enjoying good health at present. Fortunately this patient had a large, sigmoidal loop and a long mesocolon which permitted the sigmoid to drop low in the pelvis and then ascend to the colostomy opening. This dependent portion of gut acts like the ampulla on the rectum and accumulates a considerable portion of feces before emptying (Fig. 434).

Many patients with a colostomy of this type flush the bowel once in twenty-four hours and have no further difficulty. The

escape of gas is controlled by a metal cup held in position by a belt (Fig. 435). Between the cup and skin is a small rubber ring to prevent irritation and maintain cleanliness. A small pad of moist cotton is carried in the cup to prevent the rapid egress of gas. The metal cup is a great advantage over the rubber bag as it can be boiled and all odor removed. The patient usually

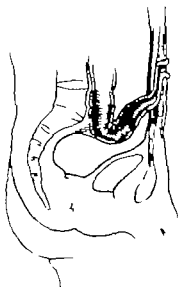


Fig. 434.—Sketch indicating favorable type of colostomy. A dependent loop of gut hanging in the pelvis. This loop accumulates feces rather than expels them as soon as they reach this region. Patient with this type of colostomy obtains good control by daily flushing of the contents which accumulate in the upper portion of the bowel. The gut is brought through the muscles and skin at different levels, giving point of application for pressure by the colostomy cup.

has two metal cups and several rubber rings, so that there can be a daily change to prevent all odor.

When there is a long mesosigmoid and sigmoid an abdominal anus is far superior to the sacral opening, as the patient has better control of bowel movements, has fewer bowel movements and has visual control of the situation.

Where the sphincters must be sacrificed and it is decided to terminate the colon on the abdomen, at times it is not necessary to remove the entire gut distal to the colostomy. The increased mortality of the combined operation is due to the traumatism

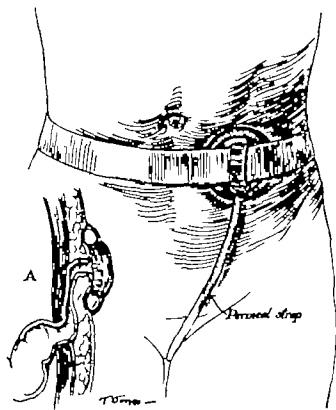


Fig. 433.—A simple and efficient colostomy cup

caused by going through the pelvic diaphragm. If the tumor mass is in the lower ampulla one may remove the diseased and suspicious tissues and leave the upper ampulla and the remainder of the rectum terminating in the manner of the usual Krasko

operation (Fig 436) that is, a **sacral anus**. Previous to this stage the colostomy should have been done in the usual manner with a long dependent loop

Carcinoma, when located at the junction of the rectum and sigmoid, or at the level of the floor of the pouch of Douglas does not offer the same prognosis as the above procedure. The

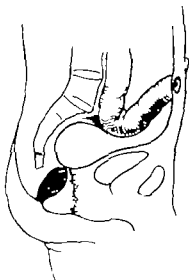


Fig. 436.—Sketch indicating the plan of technic for tumor located in the anal canal and lower ampulla. A properly constructed colostomy is superior to the artificial anus to the side of the sacrum. For this reason preliminary colostomy is done, the carcinoma and lower ampulla are resected, and the stump of the gut lying within the pelvic defect is terminated high up between the buttocks. The dotted area indicates the course of the ampulla. The operative mortality is greatly lowered by this technic.

immediate operative mortality is higher and the ultimate prognosis is not good because of the possibility of carcinomatous tissue being left behind (Fig. 438). Having had this experience, it seems to us better where the tumor mass involves that portion of the gut immediately below the peritoneal gut, to do a permanent colostomy resect the high-lying rectosigmoidal tumor and leave the ampulla in place permanently.

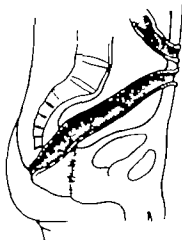


Fig. 437—This patient entered the hospital with history of ileus and was given preliminary colectomy. A carcinoma of the lower ampulla was removed by the sacral route and the gut terminated as shown in the sketch.

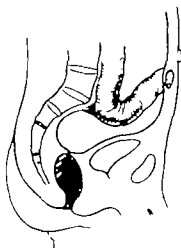


Fig. 438—Sketch indicates the scheme employed in very old or stout persons with carcinoma located at the rectosigmoidal junction. Here it is necessary to shorten and simplify the technique as much as possible. The carcinoma is resected. The distal end of the gut is turned up, covered with peritoneum, and the proximal end is brought out through the abdomen. This procedure lowers the mortality.

The next patient shows an interesting clinical record. A man sixty-eight years of age was referred to our service for a bleeding ulcerating protruding mass at the anal orifice. There was a record of frequency of urination the patient arising several times a night for a number of years. In the year prior to admission he had lost 20 pounds in weight. For the last thirty years he had suffered at irregular intervals with hemorrhoids.

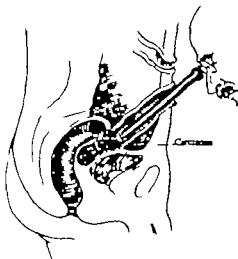


Fig. 439 Sketch indicates the pathology described in the text, where an emergency colostomy was done. The tumor was located in the sigmoid and adhered to the bladder but could not be detected by proctoscopic examination through the rectum. At operation there was some uncertainty as to whether the tumor was malignant or benign diverticulitis. Proctoscopic examination was completed through the colostomy and bit of tissue removed for diagnosis.

At times the condition became unmanageable and it was necessary for him to go to bed with hot applications until the crisis passed.

A week before entering the hospital the hemorrhoidal mass protruded again. This time he was unable to control the situation and came to the hospital for help.

Up to six weeks before entering the hospital the patient had

had little or no gastro-intestinal distress other than that mentioned above. There was occasional constipation, but no record of obstruction or the use of cathartics. Then a bloody diarrhea began and persisted until operation.

General physical examination showed condition normal for a man of sixty-eight. Examination of the anus showed an ulcerating hemorrhoidal ring. Digital examination of the rectum showed a normal mucosa throughout. In the region of the prostate an indurated tumor mass was felt. The mucosa was intact in this region. The proctoscope was passed and showed a normal rectal mucosa to the height of 14 cm. Cystoscopic examination showed a normal bladder mucosa, a moderate enlargement of the prostate, and a pronounced bulging inward of the bladder just above the prostatic level.

A barium enema was given under fluoroscopic control. The barium was seen to ascend to the sigmoid, hesitate for a time and then pass into the descending colon, leaving a defect of 1 to 2 inches. The diagnosis appeared to be carcinoma of the sigmoid adherent to the bladder with an exacerbation of the old hemorrhoidal condition.

The sloughing mass of hemorrhoids was cleaned up under local anesthesia. A few days later under gas anesthesia the abdomen was opened, explored, and a permanent colostomy established. The sigmoidal tumor was adherent to the bladder and pelvic wall. Later a proctoscopic examination through the colostomy opening showed a carcinoma.

The following history is characteristic of the insidious onset of a carcinoma in the sigmoid.

The patient, a man sixty-six years old, had always enjoyed vigorous health and up to a week before entering the hospital felt that he was perfectly normal. There had been no obstruction or irregularity of the bowel movements. There had been normal stools until a week before entering the hospital. At that time the man found some difficulty in the stool. While making an excessive effort to empty the bowel he had a sudden, sharp pain low in the pelvis, and was immediately able to pass a stool with a considerable amount of blood. Following this he was

prostrated for an hour or two but was able finally to return to his home. He consulted a physician, who urged him to go to the hospital for a more thorough examination because of the unusual history. After forty-eight hours the patient felt so much relieved that it was with difficulty that he was prevailed upon to enter the hospital.

Digital examination failed to show any tumor mass. Proctoscopic examination was negative to the level of 15 cm. Barium injection under fluoroscopic control showed a stenosis of the bowel in the middle of the sigmoidal loop.

On entering the hospital the urine was normal. The patient was in the hospital under observation for a week before operation. The urine gradually showed a change. There was an increase in the leukocytes. Bacteria suggestive of colon bacilli appeared. Forty-eight hours before operation the patient had a chill and rise in temperature, with pain in the region of the left kidney. On account of the gradual increase in obstruction it was thought advisable to operate at once.

Under ether anesthesia the abdomen was explored through a midline incision. The anterior and posterior surfaces of the liver were normal. The peritoneum of the upper abdomen was normal. Aortic glands were normal. In the lower abdomen a tumor of the sigmoid was adherent to the bladder by an area approximately 3 inches in diameter. The omentum was adherent to the colon, bladder and pelvis. The mesosigmoid showed a brawny induration. No definite glands, however, were visible.

Because of the man's age, the recent bladder disturbance and the firm adhesion between the bladder and bowel it seemed best not to attempt a primary resection especially as it was a question between carcinoma and chronic inflammation of the large bowel. A colostomy was established. At the time of operation a tentative diagnosis of carcinoma was made with the possibility of an inflammatory affair. A proctoscope was passed into the distal loop of the colostomy and a cauliflower-like tumor mass was seen. A small portion was removed and found to be an adenocarcinoma. Radium was inserted into the tumor mass through the colostomy opening. A definite opening be-

tween the rectum and bladder developed after operation. The proctoscopic examination failed to send air into the bladder at the preliminary examination. The examination made at the time tissue was removed two weeks after operation resulted in a distended bladder and passage of air through the urethra.

The latency of malignancy in this case is typical of many large bowel carcinomata and is one of the reasons why the patient reaches the surgeon in an inoperable stage.

Cancer of the rectum is frequently overlooked and mistaken for hemorrhoids by reason of the fact that digital examination is not made. The following case, however would indicate that rectal cancer may be as insidious as cancer of the colon.

A young woman twenty-eight years old was referred by her family physician for a rectal disturbance that was first manifested by a severe hemorrhage occurring with a stool two weeks before entering the hospital. Previous to the single rectal hemorrhage there had been absolutely no symptoms. Examination showed an annular growth in the ampulla of the rectum readily found by the finger. A colostomy was done and the entire rectum was removed. The growth was found to extend along the lumen of the rectum for 3 inches.

Miss P. nineteen years old, had the following record. Usual diseases of childhood and a normal pelvic history. For five years before admission she had no specific trouble, although she had not been very strong. Up to the time of the onset of the present complaint the patient had no gastro-intestinal distress. One week before entering the hospital she complained of colic in the right lower quadrant. At the end of twenty four hours a physician was called whose report showed that there was moderate tenderness in the region of the appendix with a normal temperature and a leukocyte count of 8000. On the following day a mass the size of a goose egg was palpated. On the third day the mass had disappeared and on the fourth day she was admitted to the medical side of the hospital. The patient showed a normal temperature, normal stomach findings, negative stools, normal leukocyte count and hemoglobin 85 per cent. At irregular intervals during the day the colicky pains were

noted in the lower right quadrant, but no mass was discovered during the period of observation. As the colic persisted there developed an increasing tenderness in the lower right quadrant. The patient was transferred to the surgical side for exploration. On the morning of operation a mass in the right flank the size of a hen's egg was observed.

Under ether anesthesia an incision was made over the ileocecal region. Examination showed intussusception of the small bowel into the large. The intestine was readily reduced. A small tumor mass was then felt in the cecum. Enlarged glands in the mesocolon in the region of the ileocecal valve were found. Enlarged glands were found throughout the entire distance between the colon and the aortic group although no enlargement of the aortic glands could be determined.

Eight inches of the ileum and the large gut up to the transverse colon, with the involved portion of the mesocolon and glands, were removed. A lateral anastomosis between the ileum and transverse colon was accomplished and the transverse colon omentum, and mesocolon were used to cover in the raw surfaces.

Examination showed the tumor mass to be an adenocarcinoma. The glands removed were divided into three groups, those nearest the bowel, those close up to the root of the mesocolon, and an intermediate group. All three groups showed adenocarcinoma.

The patient left the table in moderate shock, but rallied promptly and left the hospital in three weeks.

Because of the fact that carcinoma of the large gut progresses so rapidly in young people that it is usually beyond the limits of radical removal before a diagnosis is made, and because the three groups of glands showed malignant metastases, it seemed that a bad prognosis was evident.

Three years have elapsed and the young woman is still in good health. This case is interesting because it is the reverse of the usual prognosis of carcinoma of the large gut in young people, and encourages one in attempting the most extensive type of resection.

Mr. S., aged forty nine, reported to the hospital for pain in

the lower abdomen constipation, and a loss of weight of 20 pounds. Six months previously he first noticed distress in the lower abdomen which was more frequent just after eating. The distress usually lasted from one to three hours. A glass of hot water frequently gave relief. There were no acid eructations and no gas. He had used castor oil at irregular intervals for twelve years. Later he used it almost daily.

At the time of entering the hospital his bowels were moving each day. Stools were normal in caliber and contained no gross blood or mucus. Appetite had been good. He slept well and had no unusual symptoms other than occasional distress in the lower abdomen. He showed 3,200,000 reds, 7000 leukocytes, and hemoglobin 60 per cent. Stomach analyses were negative. Repeated examination of the stool showed blood both by Weber and benzidin tests. Urine was negative.

Physical examination showed a fairly well-nourished male, somewhat pale, with normal findings in the head, neck, and chest. In the region of the ascending colon a tumor mass was readily palpable. Under fluoroscopic control a barium enema was passed into the rectum. It gave a normal contour of the large bowel until the barium mixture reached a point a few inches distal to the ileocecal valve. Here the solution stopped abruptly. Although the bowel was distended rather vigorously distal to the tumor mass, it was impossible to pass through any quantity of barium. The barium meal passed readily through the stricture, showing a constriction at the point of the tumor.

The patient showed what is seen so often in these cases, a valve-like arrangement of the carcinomatous mass. The fecal current will pass through from the proximal side, but when an endeavor is made to force the barium enema against the carcinoma and in through it, a villous-like growth of the carcinoma apparently collapses and gives us a non-patent obstruction.

Under ether anesthesia the abdomen was opened by incision in the right flank. The abdomen was explored and an annular constricting mass was found in the ascending colon 2 inches above the ileocecal region. Numerous glands were found in the mesocolon and in the immediate vicinity of the mass. Enlarged

glands were strung out in an irregular manner upward and inward to a point at the level of the duodenum. The ileum was severed at a point 3 inches proximal to the ileocecal region and the transverse colon was severed at about its midpoint. The ileocecal region, ascending colon, hepatic flexure, mesocolon, and the glands up to the aorta were removed in a mass. A lateral anastomosis between the ileum and transverse colon was made in the usual manner and the abdomen was closed without drainage.

The tumor mass proved to be an adenocarcinoma surrounding the gut and involving approximately 2 inches of the colon. The lymph-glands on section showed a simple inflammatory reaction.

CLINIC OF DR. CHARLES A. PARKER

HOME FOR DESTITUTE CRIPPLED CHILDREN
(OUT PATIENT DEPARTMENT)

A SERIES OF ORTHOPEDIC CASES

Summary Eleven cases of infantile paralysis, three of tuberculosis of the hip; three of tuberculosis of the spine, one old fracture of the femur wearing Lane plate, one adolescent bow-legs, and one osteomyelitis of tibia with transposition of the fibula.

INFANTILE PARALYSIS

This child is four years old. Three months ago after an attack of fever with headache, the child's lower limbs became weak and he was unable to walk. He was taken to the County Hospital, with a diagnosis of infantile paralysis. He remained in the hospital eight weeks and recently returned to his home.

He is now wearing full length leg casts made bivalve for removal. This is a prophylactic measure now regularly used in the County Hospital and Durand Hospital, our two quarantine hospitals for infantile paralysis. The application of casts or other fixing apparatus practically insures against deformity from unbalanced muscles and is used in all cases where there is potential deformity as for instance, when the anterior tibial group of muscles is paralyzed we know equinus will result unless the foot is protected from the constant action of the gastrocnemius and soleus, or a valgus after paralysis of the tibiales. This is usually done in the quarantine stage the first four to five weeks, when there is never much difficulty in putting the limbs in the proper position of extension at the knees and with the feet at right angles with the legs both anteroposteriorly and laterally. With the casts off while lying on his back he can maintain either leg extended at the knee and elevated from the

recently left the County Hospital after quarantine for infantile paralysis.

It first came to our clinic a few weeks ago wearing a cast on the right leg. It can now maintain the leg extended at the knee, but as the foot is still inclined to valgus we advise an elevation of the inner half of the sole $\frac{1}{4}$ inch.

The next 9 cases are older cases of infantile paralysis, some that have been under our control since the original attack, with no resulting deformities, and others coming with more or less extensive deformities demanding corrective procedures by operation and apparatus.

What is so easy to maintain by early and proper treatment is often very difficult or even impossible to obtain by later orthopedic measures. It is our rule of practice never to put a brace on a deformed limb if there is any possibility of overcoming the deformity first. This refers particularly to the lower extremity. When the knee completely extends and the sole of the foot rests properly on the floor although the muscles may be completely paralyzed throughout the limb this position of the limb is easily maintained by a brace when the whole weight of the body is put on the limb in walking. In fact, often the limb will maintain the weight without the brace when the extended knee throws most of the weight in front of the axis of flexion. A brace allowing no movement at the knee in walking however adds to the security. Where knee extension is imperfect the brace is absolutely necessary to prevent collapse when the body weight is put on the leg. Figures 440 and 441 show a good form of brace with a joint at the knee that remains locked when standing but by means of a handy contrivance can be bent when sitting. This brace has a foot-piece to which the foot is strapped before it is put in the shoe.

A brace can be fastened to the outside of the shoe where the foot is normal, which is rarely the case when a long splint is needed. No ordinary shoe can be depended upon to maintain a deformed or disabled foot in shape, and no apparatus on the outside will take the place of a definite fixing apparatus, independent of the shoe, on the inside. In the rarer cases where the

table for a short time. That means that his extensors of the knee and flexors of the hip are competent, although not necessarily full strength.

The right foot inclines to equinus, with slight valgus, but apparently all muscles are acting.

The left foot inclines more strongly to equinus and valgus and the tibialis anticus is not observed. There are general movements of the toes in both feet. The child is somewhat peevish and does not co-ordinate well in the tests so complete reactions are not always obtained in the short time given to the case in the clinic where we have many to care for during the afternoon. We do however try to ascertain the salient features so as to guard against deformities, and then make more complete muscle surveys at our leisure. Much of this part of the work is now done by the specially trained nurses of the Visiting Nurse Association assigned to infantile paralysis cases.

The abdominal muscles are apparently effective, although complete examination is not feasible with the patient's present lack of co-operation. However we will keep him lying down to protect this region and replace the casts upon his legs to maintain this present good position while awaiting gradual recovery of the cord lesion and resumption of muscle functions. The upper extremities are competent, that is, they can perform all their normal functions without determining their variations from normal strength. The thumbs however show weakened action of the *opponens pollicis* more apparent in the right than in the left. Next to the deltoid, Lovett says this is the most frequently paralyzed muscle of the upper extremity.

While we are in the habit of considering difficulties of locomotion as the most serious result of infantile paralysis, on account of their particularly obtrusive character that is immediately apparent, yet, the paralysis of the upper extremity affecting seriously the more varied and complex functions of the arms and the hands, are really the greater handicaps. A person can walk with an artificial leg but there is no substitute for the human hand.

The next patient is a child of twenty months who has

inside foot-piece can be dispensed with and the brace fastened directly to the shoe. It requires the services of an expert to change one's shoes. With the foot piece connected with the brace shoes can be changed by the patient as often as desired. You observe we do our own measuring for braces either by tracing the limb on paper or by making a plaster-of-Paris pattern to send to the instrument maker. Further care of these cases you will see from time to time as these and others cases come to the clinic during the course.

We will have something to say of muscle training in these cases at some other time, but this should always be kept in mind, that where there are no muscles there will be no result from their training.

OLD FRACTURE OF FEMUR STILL WEARING LANE PLATE

I operated upon this child at the Children's Memorial Hospital six years ago for an overlapping fracture of the right femur. The child had also had a previous attack of infantile paralysis affecting the injured limb. The mother comes now to see if anything more can be done for the paralysis. The plate is still in place and causes her no inconvenience.

I believe that the Lane plate is the simplest contrivance yet invented for holding recent fractures in position, and, being the simplest, it is also the safest. It requires the minimum operative procedure to place and reduces the shock of an operation accordingly. Of course it should be used only when simpler non-operative means are not satisfactory. It can be removed after performing its function when it is superficially situated and liable to injury or when it becomes loosened or a menace from any cause by a small operation with very little operative risk.

TUBERCULOSIS OF THE HIP

This boy who is now seven years old first came to us when he was four years old with a history of several months of increasing trouble with the left hip. He would suddenly awaken in the night crying with pain in the hip and knee. He also limped when he walked. At the time of the original examination the



Fig. 440.—Full length leg brace, with joints at knee and ankle and buckle lock at knee. Front view.



Fig. 441.—Full length leg brace, with joints at knee and ankle and buckle lock at knee. Side view showing details of joints at knee and ankle and the buckle lock at the knee.

while recovering from his hip disease. It may be six months or a year till he is safe to go without a cast or other apparatus. The joint must be entirely free from pain on attempts at movement, and the limitation of movement which usually occurs must be mechanical from fibrous adhesions and changed joint relations rather than from reflex muscle rigidity on guard during the active stage of the disease.



Fig. 442.—Active tuberculosis of right hip, with destruction of the head of the femur and upward displacement of the lesser

The next case appears before us for the first time. The child is four years old and suffering acutely. He is wearing a double Thomas hip splint which does not hold him well. The right hip is greatly swollen and tender. The trouble began eight months ago and has gradually developed. This is undoubtedly a case of tuberculosis. After an x ray is taken a cast will be applied to the hip and the child put to bed.

left hip could be flexed 90 degrees and there was limitation in extension, abduction, and rotation. An x-ray at the time left us in doubt as to the pathology but the hip and leg were put in a plaster spica. He was then kept in casts which were changed at intervals of six to twelve weeks, with little change in local symptoms until in August, 1918 when he had severe pain in the hip. In May 1919 an abscess was detected on the front of the thigh, confirming the tentative diagnosis of tuberculosis. According to our usual procedure this was not opened, but kept in the cast with a window over the abscess to allow of spontaneous rupture. This abscess opened in January 1920. As the parents had been told not to be alarmed when it opened, but to dress it with sterile gauze until they could return to the clinic, it was three weeks before they came to us, the sinus still discharging and the boy quite comfortable. This is our rule in the treatment of tuberculous abscesses from joint disease in children, to allow them gradually to open spontaneously. This has two advantages first, in a number of cases the abscess disappears without discharging and, second, in those that do discharge the long process of round-cell infiltration of the superficial tissues prior to rupture appears to exert a distinct prophylaxis against violent reaction that frequently occurs when they are opened operatively. Puncture and injection have not recommended themselves, as they quickly refill with fluid, and the chance of the injection reaching the infecting focus is quite remote. Even if it did reach it, there is little evidence that it would exert a beneficial action. In the hands of the originators of the treatment Beck's paste injected into the sinuses has exerted a beneficial, if not specific, influence in these cases but it is now used comparatively little by orthopedic surgeons, as the results obtained have not come up to their expectations.

This boy's sinus is now closed and the scar is drawn in toward the deep tissues due to the contraction of the fibrous tissue of the tract. This is rightly considered a good omen of approaching cure or at least termination of that particular abscess. The hip is still somewhat sensitive, so new spica will be put on and the boy allowed to go home on crutches. He is now attending school

touch. There is also some limitation to complete extension in the right hip—on the side opposite to the swelling. No other symptoms are present. No swelling can be detected in the iliac fossa so the limitation of hip motion is probably due to passive limitation of recurring spinal disease.

There is no absolute guarantee against recurrence though fortunately in many cases it does not take place and healing is permanent. This child shall now have a plaster jacket and be treated as an active case.

This young man is lying on a Bradford frame on which he was transported from his home to the clinic. He is in good flesh and color. His back, as you see, has an extreme kyphos composed of most of the lower dorsal vertebrae. The history shows that his trouble was present when nine years old, that he first lay on a Bradford frame in this hospital for six months and after that wore casts or a brace for four years, when he was considered cured. For six years he was apparently well and able to work until last fall, when he came to us barely able to walk. He had loss of muscular control of the legs and the knee reflexes were greatly exaggerated. He was advised to go on a Bradford frame at once. He has been on the frame since then except for a brief interval the last month. His reflexes are now nearly normal. He has had some massage of the legs to limber up his joints. He is not to attempt walking for some time yet. There are no apparent abscesses and the boy will in all probability regain his functions if we make haste slowly.

BOW-LEGS IN AN ADOLESCENT

This young lady (colored) is now seventeen years old and is naturally very much concerned about the shape of her legs, which you will observe are extremely bowed. A peculiarity of this type of bow leg is that the curve is all in the femur and not in the leg below the knee. When the parts below the knee are placed together you see they are straight. In practically all of the younger children the bow is below the knee and requires correction of the tibia and fibula for a cure.

This case will require an osteotomy of both femurs just below

(Later Fig 442 is the x-ray showing extensive destruction of the head, neck, and acetabulum. The child was so much relieved by the cast that his parents took him away from the hospital four days later against our most vigorous protests.)

The next case is briefly an old tuberculosis of the left hip, now quite painless and healed, in this twelve-year-old girl. The leg as a result of destruction of joint elements is $\frac{1}{2}$ inch shorter than the right, but on account of permanent flexion of 45 degrees it appears 2 inches shorter than the right. This patient should have a subtrochanteric osteotomy of the short leg. This materially reduces the apparent shortening and allows the girl to stand much straighter and to walk with a less noticeable limp.

TUBERCULOSIS OF THE SPINE

The next 3 are cases of tuberculosis of the spine. This boy is seven years old and is wearing a plaster jacket although he is apparently entirely healed. The disease has been under treatment between two and three years, and practically the only evidence remaining is the small but distinct kyphos at the dorso-lumbar junction. As his cast has been on several months, it will be changed today. The new one is needed for protection against recurrence for six months or a year longer.

This boy is now ten years old and comes with this extreme kyphos in the middorsal region. It is very much worse than the previous case. You will observe this extensive scar in the region of the deformity. The history says an Albee operation was performed upon this child in 1913 by one of our orthopedic surgeons. The long scar on the left shin shows the source of the transplant. Four months after the operation apparently all supports were removed. The child evidently did well, as this is the first return visit to our clinic after seven years. I do not know whether the kyphosis has increased or not, but it could not be much worse. He comes now on account of limitation of motion in the right hip and limp. There is also a small fluctuating swelling appearing under the lower border of the left ribs near the erector spinae that is not reddened nor tender to

the convexity outward. The tibia had not been reproduced after the operation. The record at first advises a transplant of a part of the right tibia to the left leg but this was not done. After considering the probability of infection of a transplant



Fig. 445. Transposition of fibula with the ends in relation to the remnants of the diaphysis of the tibia soon after operation. Position of leg faulty

embedded in an osteomyelitic area it was decided that transposition of the left fibula into the hiatus of the tibia would be more likely to succeed in the face of probable infection. Accordingly this was done in June, 1917. The shaft of the fibula was severed at each end just short of the epiphysis, and a path

the condyles the legs to be put in plaster cast for ten weeks to maintain the correction secured.



Fig. 443 —Bow-legs in girl due to deformity in the lower end of the femur (Photo loaned by Dr. Blanchard)



Fig. 444 —Same patient as Fig. 443, boot three months later (Photo loaned by Dr. Blanchard)

These photographs show the results obtained in a similar case, and we shall expect the same result here (Figs. 443-444)

OSTEOMYELITIS OF TIBIA WITH TRANSPOSITION OF FIBULA

This little girl came on our service three years ago with the history of a previous operation for osteomyelitis in which most of the shaft of the left tibia had been resected, resulting in an upward dislocation of the fibula and a bowing of the leg with

c quality of bone to adapt itself to its use—the principle expressed in Wolff's law



Fig. 447—Same as Figs. 445, 446 fourteen months after Fig. 446, show good alignment and union of the greatly hypertrophied transposed fibula with the remnants of the tibial diaphysis, while maintaining union with its cranial fragments.

This transposed fibula is now nearly the size of a normal fibula and much larger than a normal fibula ever becomes even

opened up between the anterior and posterior groups of muscles with the least disturbance of structures attached to the fibula. The ends were then embedded in the remaining stumps of the tibial shaft. The position was difficult to control even with a cast and the infection which developed. The series of x-ray plates will, however, show the progress of the case, and the good



Fig. 446.—Same as Fig. 445, twelve months later. Alignment better and fibula hypertrophied.

function of the leg, which is now quite stable, will endorse the method pursued (Figs. 445-447). The leg is about 2 inches shorter than the other, but it carries her weight well and does not give out. She has been wearing this brace to safeguard the position, and although she walks well without it, she wants it readjusted for further use.

This is an extremely instructive demonstration of the physio-

CLINIC OF DR. ALBERT E. HALSTEAD

ST. LUKE'S HOSPITAL

ILEOCOLIC INTUSSUSCEPTION PROTRUDING THROUGH THE ANUS OPERATION AND RECOVERY

(REPORTED BY DR. FREDERICK CHRISTOPHER)

Summary Acute ileocolic intussusception in an infant of four months.
Operation and recovery Four types of intussusception. Mortality
Treatment

PATIENT R. A. No 136,821 a nursing infant of four months, was admitted to St. Luke's Hospital on March 22 1920 as a boarder. The mother on whom a diagnosis of cholecystitis was made was admitted for observation, and discharged without operation. The infant had had a spontaneous birth and previous to admission had been in excellent health. The family history was negative.

At 7 P. M. on the day of admission when brought to the mother the infant refused to nurse and vomited 2 ounces of greenish material. Examination at this time showed that about 1 ounce of bright red blood had been passed from the rectum. At 8 P. M. there was no rigidity of the abdominal wall. Palpation of the left lower quadrant revealed a sausage-shaped tumor which was approximately 3 inches in length by $1\frac{1}{2}$ inches in width. It was firm and somewhat movable. On rectal examination there was a bulging downward when the tumor was pressed toward the pelvis.

Patient was first seen by Dr. Halstead at 8.30 P. M. At the time the latter operated, which was three hours after the first appearance of the symptoms the ileum which was the portion of the bowel constituting the head of the intussusception, presented at the anus (Fig. 448)

in an adult. It is not ideally placed between the two portions of the tibia, but we agree that it is efficient. This case further exemplifies a recently promulgated unsound practice of early removal of the shaft of a long bone for osteomyelitis before the involucrum has properly developed, a protective process that ordinarily takes several months. In the more fortunate cases of early removal the shaft is renewed from the osseous elements attached to the preserved periosteum, but there is no certainty that a bone will be thus reproduced, and in the present case it is quite apparent that it was not.

This would seem the least reprehensible where but one of the two bones of the leg is removed but to advocate such practice in the single bones, as the humerus and the femur with the expectation of later filling the gap with a transplant is the height of radicalism, not to call it something worse. We will now adjourn to the plaster room to put on such casts as we have advised during the clinic.

above the ileocecal valve which was darkened in color to a bluish black and had several areas of necrosis varying in size from 1 to 2 cm in diameter was covered with a small piece of omentum which had been cut off from its attachment. The

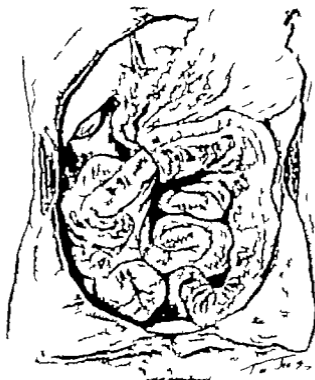


Fig. 449 Diagrammatic sketch showing appearance of intussusception on opening the abdomen

ring of traumatized serosa and muscularis which marked the neck of the intussusception was unfolded by suturing together the uninjured serosa on each side of it (Fig. 450). The abdominal wall was closed in layers without drainage.

Postoperative Course.—The first day after operation the

A midline incision was made immediately below the umbilicus. The neck of the intussusception was found to be in the upper midabdomen (Fig 449). The large intestine was delivered

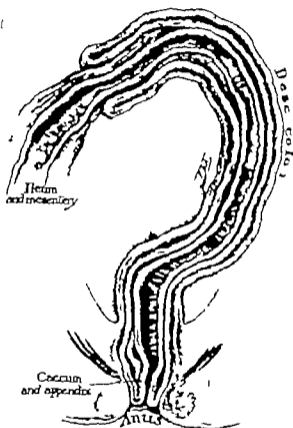


Fig. 448.—Cross-section showing extent of intussusception in present case.

to the surface of the abdomen and the intussuscepted small intestine manipulated toward the cecum. The ileum was pushed entirely out of the large intestine and the distal end of it just

hours, which was followed by a formula. On the seventh day a furuncle in the external canal of the right ear was incised and an otitis media of the left ear was noticed. The stitches were removed on the ninth day and the patient was transferred to the Pediatric Service. The white blood count was 22 050 on the second day after the operation and fell gradually to 17,850 on the seventh day after operation. The temperature was normal on the fourth day after operation and was not again elevated during the patient's stay in the hospital. The child was discharged on the thirteenth day after operation with wound cleanly healed and the bowel movements, temperature and blood counts normal.

Discussion.—Intussusception is primarily a disease of young infants and is two to three times more common in males than in females. Holt collected 358 cases under ten years, and found the age of occurrence as follows: Under six months, 141; between six and twelve months, 89; between the first and second year 32; between the second and tenth year 96. Three-fourths of the cases in childhood, therefore, are in the first two years, and one-half of them between the fourth and ninth month.

There are four chief types of intussusception, namely:

1. The ileac or enteric (Fig. 451) where the invagination is limited to the small intestine and is not to be confused with the agonal ileac intussusceptions found at autopsy of which there may be several in number.

2. The colic (Fig. 451) where the invagination is of the large intestine only.

3. The ileocolic (Fig. 451) in which there is invagination of the ileum through the ileocecal valve, and in which while the cecum may be invaginated secondarily the ileum remains as the most prominent protruding portion.

4. The ileocecal (Fig. 451) which is the form most often seen. In this the cecum with the ileum behind it passes into the colon, the valve continuing to be the apex of the projecting portion.

There may also be retrograde intussusceptions where the lower part of the intestine is invaginated into the upper; there

rectal temperature reached 103.6° F and the pulse remained at about 150. The patient was given paregoric, 20 drops, every four hours for one day and mother's milk 2 ounces every

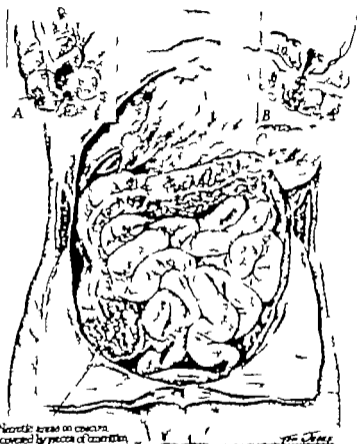


Fig. 450.—Diagrammatic sketch illustrating the method of repair employed

three hours during the day. Thirty five hours after the operation the patient had a large dark green stool tinged with blood, and from then on there were regular free bowel movements. On the fourth day the patient was given a nursing every two

In a similar analysis of 380 cases Koch and Oerum found the following percentages

Variety	Percentage under one year	Percentage over one year
Ileocecal	49.5	38.0
Ileac	2.6	9.2
Colic	12.0	23.7
Ileocolic	3.3	1.3
Mixed	3.9	1.9
Undetermined ²	28.0	25.7

In the typical acute cases the diagnosis is generally made without much difficulty. The two factors to be considered are sudden onset, intermittent pain of very great severity vomiting tumor mass which is most often felt in the rectum and along the course of the colon bloody stools, constipation and great prostration. In 22 out of 188 cases Holt found the tumor mass to be protruding from the anus.

In rare instances the cure of intussusception has been known to have occurred spontaneously by sloughing of the invaginated portion, the continuity of the intestine being preserved as in a case of Dr. A. E. Halstead's. Kelley tells some curious methods of reduction formerly in vogue but which have now become obsolete, placing quick silver in the bowel with the patient inverted and inflating the sheep's colon which had been introduced into the child's colon were tried. A very few early cases may yield to abdominal taxis. There are enthusiastic advocates of attempting reduction by forcing air and water into the rectum. Three to five pounds to the square inch (water bag 7½ feet to 12½ feet above the patient) for twenty five to thirty minutes has been recommended. Modern opinion is tending more and more to the idea that immediate surgical intervention is the best treatment for intussusception. Gibson analyzed 187 operative cases in regard to the mortality with reference to the age of the case. He found that if operation took place on the first day of the disease the mortality was 37 per cent. on the second day 39 per cent. on the third day

may be mixed types there may be even double (Fig 451) and triple (Fig 451) intussusceptions and even intussusceptions of the appendix, which Murphy thinks may cause enterocolic intussusception.

The entering cylinder of the invagination is called the *intussusception*, and the receiving cylinder the *intussuscipiens*.

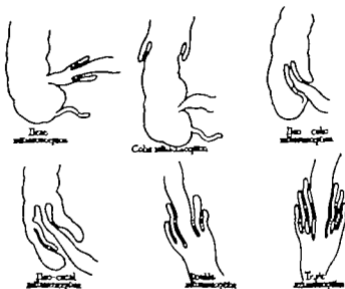


Fig 451.—Diagram showing different types of intussusception

The *Ileocolic* type of intussusception occurs by far the most frequently one author finding it in 89 per cent. of the cases and another in 82 per cent. Leichtenstern analyzed 180 cases and found the percentage of the different types in the various years to be as follows

Variety	Percentage under two years	Percentage between two and five years	Percentage between six and ten years
Ileocolic	70	49	61
Ileocolic	6	13	38
Colic	19	25	21
Ileocolic	4	13	0

In a similar analysis of 380 cases Koch and Oerum found the following percentages

Variety	Percentage under one year	Percentage over one year
Ileocecal	49.5	38.0
Ileac	2.6	9.2
Colic	12.0	23.7
Ileocolic	3.5	1.3
Mixed	3.9	1.9
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Probably large proportion of these are ileocecal.

61 per cent. on the fourth day 67 per cent. on the fifth day 73 per cent. and on the sixth day 75 per cent. Kimbison in analyzing 147 cases found the mortality to be only 14 per cent. when the operation was performed in the first twelve hours.

After laparotomy has been performed an attempt should be made to disinvaginate the intussusception by gently pressing or milking the intussusceptum upward without making traction on its free end. Damage to the wall of the gut should be repaired, as was done in the present case. The mesentery may be shortened if it is thought that by doing so a recurrence of the intussusception will be prevented.

Should disinvagination fail the following procedures are to be considered

1. Resection of the gut involved.

2. Excision of the intussusception by making a longitudinal incision in the intussusceptions and cutting out the intussusceptum and then sewing together the cut ends.

3. Coffey's operation, which consists essentially of excision of the intussusceptum, closure of the adjacent ends of the gut, and then the anastomosis of these segments.

4. K. Israel's operation, where the intussusceptions is sutured to the parietal peritoneum before it is incised and the intussusceptum is then excised

5. Ellsworth Elliot, Jr's operation, in which a soft-rubber catheter is passed through the canal of the intussusception, out through the opening in the uninjured gut, and out through the abdominal wall.

6. The segregation operation, where an anastomosis is established between the patent gut above and below the intussusception.

7. The production of an artificial anus in cases of severe shock, leaving the intussusception inside the abdomen.

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PHLEBITIS OF APPENDICAL ORIGIN SIMULATING LUNG ABSCESS

(REPORTED BY DR. FREDERICK CHRISTOPHER)

Summary Phlebitis of appendical origin simulating lung abscess in patient who had influenzal pneumonia three weeks before admission to the hospital. Diagnosis revealed at autopsy. Review of the literature.

Mr. A. F. No. 136,205 entered St. Luke's Hospital on January 31, 1920 on a stretcher. The patient complained of chills and sweats of about one week's duration. He had had influenzal pneumonia three weeks before entrance with chills, fever, hemoptysis, and dyspnea. There had been pneumonia first on the right side and then on the left, with the crisis two weeks after the onset. During the week which followed the crisis and preceded the patient's entrance into St. Luke's Hospital there had been a series of seven or eight chills with sweating. *There were no complaints other than chills and sweats on entrance.*

On admission the physical findings were drowsiness, pupils contracted and not reacting to light (due to morphin received before entering the hospital), sclerae yellow, throat red and dry, râles in the back portion of the lower lobe of the right lung. The diagnosis of lung abscess in the back part of the right lower lung was made. A Ray examination on January 31st showed a large mass in the upper right quadrant of the abdomen which had the shape of the kidney although it was very high, extending up to the twelfth dorsal vertebra. There was marked peribronchial thickening on both sides especially on the right. The right diaphragm was high. The right costophrenic angle was unusually clear. Both apices were hard. There was a marked amount of thickening along both upper lobes. There was evidence of an old process in the right base following a pneumonia which gave the impression of a partly collapsed lung with a large amount of thickening of the pleura. **Summary.** Partially collapsed lung with a large amount of adhesions and some fluid in the base.

Repeated exploratory punctures of the right base were negative. On February 3d an abdominal incision was made and the gall-bladder was revealed which was somewhat whiter than normal, and this was drained. Exploratory punctures were negative until February 21st, when 40 ounces of straw



Fig. 452.—Diagrammatic sketch of normal portal circulation.

colored translucent fluid were aspirated from the left pleural sac. There was at this time a small amount of edema of the legs, ankles, and tissues on the sternum. On February 22d there was a positive Kernig sign, with some rigidity of the neck. The patient was given plenty of water and a soft diet. At

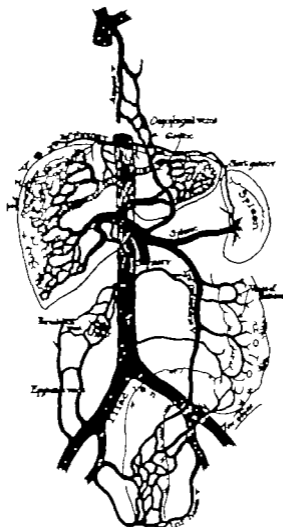


Fig. 433.—Diagrammatic sketch showing the different routes of the collateral portal circulation.

the beginning of each chill morphin sulphate gr $\frac{1}{4}$ atropin sulphate gr $\frac{1}{8}$ were given hypodermically Pituitrin, one ampule hypodermically and digitalin, $\frac{1}{2}$ to 1 ampule hypo-

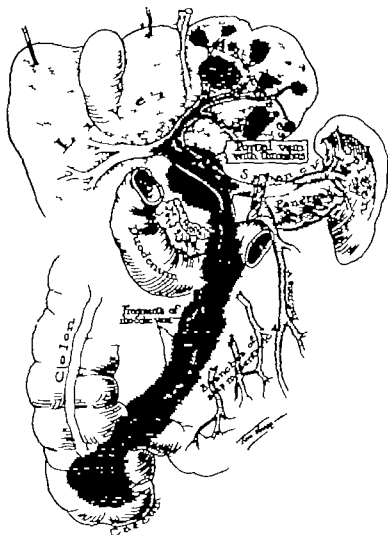


Fig. 434.—Diagrammatic sketch illustrating case reported. The path of the abscess is shown extending from the region of the appendix to the portal vein.

dermically or intravenously were given from time to time. Camphorated oil, 1 to 4 grains hypodermically and caffeine sodium benzoate, grains 2 were also given. Various enemas were administered. Intravenous injections of saline were given toward the end and sponge baths to reduce the fever.

The fluid which had been aspirated from the left pleural cavity had a specific gravity of 1010 and on culture showed staphylococcus. The blood-cultures were negative. The urine contained a trace of albumin, few hyaline and granular casts, a few epithelial and white cells, and an occasional erythrocyte. The white blood count was about 15 000. On January 31st the red count was 3 460 000 and the hemoglobin was 67 per cent. On March 3d the red count was 2 440 000 the hemoglobin 55 per cent. There was anisocytosis poikilocytosis, and polychromatophilia. On February 14th three normoblasts and 1 megaloblast were seen. There was a remittent fever ranging from 100° to 106.4 F with two daily variations of 3 to 5 degrees. The pulse varied similarly between 90 and 160. After February 16th there was only one daily remission of 1.5 degrees the pulse varying between 120 and 150. The patient was very restless and irrational a good part of the time. On February 20th his right hand and left foot were placed under restraint. Beginning February 21st the patient began to be incontinent and had involuntary defecations. The pulse at the same time became very irregular. The patient died on March 12 1920 after forty-one days in the hospital.

Necropsy was performed by Dr. Edwin F. Hirsch on March 12 1920. The record was written and certain details of direction were worked out by Dr. A. J. Peterson. The following is an abstract of the protocol.

"The subcutaneous fat of the midline of the trunk in front is yellow lobulated and at the level of the umbilicus 1.5 cm. thick. The skeletal muscles are pale pink. Opposite the umbilicus on the peritoneal surface is an infarcted tag of fat, 2.5 x 0.6 cm. attached by a base 0.5 cm. in diameter. In the peritoneal cavity there is about 500 c.c. of yellow slightly turbid fluid. The opening opposite the surgically incised wound

extends to the peritoneal surface on the inner side of an opening 1.5 cm. in diameter. The omentum covers the upper part of the bowel in front, is lobulated with yellow fat. The loops of small bowel are everywhere very moist. Upon lifting up the cecum the slight tension of the tissues at this place permits of the escape of yellow exudate slightly toward the midline. At this place there is marked necrosis and blackening of the tissues, the details of which will be given later. On the left side there is an intersigmoid fossa admitting easily the distal half of the index-finger. On the left side the mesosigmoid where it arches over the brim of the pelvis is adherent by several band-like fibrous adhesions. The inguinal and femoral rings are closed. The spleen is moderately increased in size. In the midline 4 cm. below the xiphoid on making the usual midline incision into the abdomen there is exposed an abscess with a necrotic wall having an opening 1.5 to 2 cm. in diameter leading down to an abscess in the left lobe of the liver. In the region of the gall-bladder there are firm fibrous adhesions between the transverse mesocolon, the transverse colon, the pylorus of the stomach, and the parietal peritoneum opposite this place.

"The costal cartilage cut easily. On the right side the pleural cavity is partially obliterated by firm fibrous adhesions. On the left side the lung is somewhat flattened and the pleural cavity contains about a liter of slightly turbid yellow fluid. The pericardial sac is hyperemic and covered with a little thin layer of fibrin. The sac contains about 150 c.c. of very yellow clear fluid. The body is eviscerated in the usual manner and the organs of the chest and abdomen examined from behind. The lining of the aorta is roughened moderately by many slightly raised circular and linear areas of fatty change, especially about the vessels of the celiac axis and abdominal part of the aorta. There is moderate postmortem digestion of the lining of the esophagus. The lining of the trachea and main bronchi is reddened, and the mucous lining of the main bronchus of the left lung contains numerous small petechial hemorrhages. There is a little frothy fluid on the lining of these membranes.

On the anterior surface of the apex of the heart there is a

tag of partly organised fibrin adherent by a base of about 9.5 cm. area this tag of fibrin is 1×0.8 cm. and 2 cm thick. There is a moderate amount of subpericardial adipose tissue. The leaflets of the tricuspid valve are not changed particularly. On the anterior mitral leaflet there are patches of fibrous tissue there are similar ones on the posterior but not so extensive. In the left chamber of the heart there is a fibrous band 2 millimeters in thickness which on slight tension is 27 cm long and extends across from the base of the papillary muscle of the anterior leaflet to the septum. The root of the aorta is toughened slightly by yellow circular and linear areas of 1 mm. width and 2 mm. diameter of fatty infiltration. There are no changes in the leaflets of the aortic valve. The mouths of the coronary arteries are patent. On the right side there are the mouths of three accessory coronary arteries in addition to the usual one. The myocardium is pale red and rather soft and presents a moderate degree of cloudy swelling. There are no alterations in the superior and inferior vena cava. At the site of the old eustachian valve there is a broad loosely meshed membrane which with slight tension is 3.5 cm. at its broadest dimension and 7 cm. wide.

The posterior part of the right lung is somewhat firmer than anteriorly and is boggy. On surfaces made by sectioning the organ a large quantity of frothy blood-stained fluid escapes. The tissues are somewhat firmer than normal, but without glandular surfaces. The left lung is compressed somewhat. On the outer surface of the left lung there is a thin fibrinous exudate, limited chiefly to the lower lobe. The peribronchial lymph-nodes are not especially enlarged and are black with coal-dust pigmentation.

There is marked loss of the yellow substance of the adrenal cortices.

The perirenal adipose tissue is fairly abundant. There is slight tension of the kidney tissues underneath the capsule. The cortical striations are somewhat diminished, the parenchyma of the organ distinctly yellow. There are no changes in the right ureter. The capsule of the kidney strips easily leaving

a smooth, slightly yellow injected surface. The left kidney is slightly larger than the right. There are no changes in the left ureter. The description of the left kidney in general corresponds with that of the right. The capsule strips easily leaving a perfectly smooth surface. The right kidney weighs 170 gm. the left, 200

"The biliary lymph-glands are markedly increased in size. There are no changes in the common bile-duct. The portal vein is completely obstructed by an infected thrombus, which is yellow and contains an exudate 9.5×2 cm. It extends down as far as and into the splenic vein a distance of 1.5 cm.

"The appendix lies medially and behind the cecum it is over all 10 cm. long, the distal 7 of which is distended to a width on the average of 1.8 cm. This part of the appendix is bound down by organizing fibrinous and rather firm fibrous adhesions. To the midline there is a greenish discoloration of the tissues over an area of 3.5 cm. diameter there is also in the mesentery of the small bowel a greenish discoloration of the fat. The mesenteric lymph-glands are moderately increased in size.

The spleen is 16 cm. long 10 wide, and 6 thick there are multiple septic infarcts, one having ruptured to the surface in removal, as large as 2×1.3 cm. the others smaller. The spleen weighs 255 gm.

The ramifications of the portal vein in the liver are filled with yellow pus, and in the left lobe of the liver there are multiple abscesses one of them 4×2 cm. that contains slightly brown and yellow exudate. It is estimated that there are probably ten to twelve such abscesses. The liver weighs 1844 gm. The gall-bladder is adherent by fibrous tissue as indicated in the preceding part of the record its lining is reddened moderately but quite velvety and smooth.

The portal vein is apparently completely obstructed by an infected thrombus, which is yellow and ed. This thrombus extends into the liver portion of the portal vein and as far down as the splenic vein. The lining of the splenic vein is smooth and unchanged the same is true of the lining of the

inferior mesenteric vein which is opened as far as its finer ramifications. The lining of what is apparently the right colic vein is pitted and eroded its proximal end is completely destroyed so that it opens into a large abscess 3 to 4 cm. in diameter of reddish necrotic material, which is immediately below the portal vein, where the splenic vein joins it. It is possible to trace this vessel distally for 9 to 10 cm. only. What is apparently an intestinal vein can be traced from the abscess mentioned to the cut edge of the mesentery of the small bowel where, by the way of a small anastomosing branch, another intestinal vein is followed back to the abscess. The linings of these intestinal veins are smooth and unchanged except in their proximal 3 to 4 cm. where they are blackish green and yellow. No connection can be made out between the right colic vein or the two intestinal veins described and the portal vein. There is no trace of the main branch of the superior mesenteric vein.

The vermiform appendix is retrocecal and points medially it is about 10 cm. long and 1.8 cm. wide. It is bound down by firm fibrous adhesions. It is blackish green and gangrenous except for the proximal 1 cm. which is pink. The appendix is opened lengthwise, and a large amount of yellow pus runs out. The appendix is blackish green throughout its entire thickness its lining is pitted and eroded. There is an opening 3 to 4 mm. in diameter on its front wall 1.5 cm. from its distal end. A probe inserted through this hole passes into a retrocecal cavity filled with yellow purulent material, which oozes through the opening. This cavity is about 3 cm. in diameter lined with blackish green necrotic material, and lies rather in front of the appendix. The cavity is continuous with an abscess, similarly lined and containing yellow purulent material, 1.5 to 4 cm. in diameter which extends rather directly upward through the root of the mesentery of the small bowel to the abscess already described, which lies between the pancreas and the duodenum and below the portal vein, where the splenic vein joins it. This abscess which runs through the root of the mesentery of the small bowel and slightly to the right of it

apparently occupies the site of the superior mesenteric vein and its ileocolic branch. This abscess extends up between the pancreas and the duodenum to the greater curvature of the stomach where it produces an ulcer-like thinning of the serosa wall of the pyloric antrum in an area 6 mm. in diameter.

"A thrombus, worm-like in shape 1 cm. long and 0.2 in diameter colored red, brown and yellow in transverse layers, is in a vein in the tissues between the bladder and the rectum; this vessel cannot be identified.

"The portal vein is apparently completely obstructed by an infected thrombus in the first 2 to 3 cm. of its intrahepatic portion. The capsule of the liver is smooth and pink. There are five to six green patches, 2 to 4 cm. in diameter on the front part of the upper surface of the left lobe of the liver. Two of these are ruptured and lead by openings of 1 to 1.5 cm. diameter to cavities containing yellow purulent material. The front half of the lower surface of the left lobe contains three to four yellow spots, 0.5 to 2 cm. in diameter. There is a ruptured abscess, about 2 cm. in diameter in the surface of the liver and just to the right of the tip of the gall-bladder. The branch of the portal vein to the left lobe of the liver leads to multiple abscesses. It is difficult to make out any venous wall beyond the thrombus described above, as all is a mass of yellow and green pus. The branch of the portal vein to the right lobe is also filled with yellow and green pus, but there are no abscesses present. Yet it is possible to express a greenish yellow pus from the finer ramifications of the portal vein in this lobe on the sectioned surface. On surfaces made by sectioning the liver the centers of the lobules are bright red; the peripheries distinctly yellow.

"The lining of the stomach is smooth and is moderately hyperemic in its lower portion. There are no changes in the lining of the urinary bladder, prostate, seminal vesicles, rectum or colon.

"There is hyperemia of the lining of the upper portion of the small bowel.

"There are no changes in either submaxillary gland. There

are no changes in the right internal jugular vein the same is true of the left one. There is a little fatty infiltration in the lining of the common carotid arteries. The left tonsil is small, and contains only a small amount of lymphoid tissue the same is true of the right. The muscle of the tongue is pale pink. There are no changes in the upper portion of the pharynx or larynx. The laryngeal cartilage is ossified. The tissues of the thyroid gland are unchanged.

Bacteriology—Cultures of the heart's blood, abscesses of the spleen, and left pleural fluid contained chiefly *Staphylococcus albus*. While those from the portal thrombus and liver abscesses were mixed the predominant organism was also a *Staphylococcus albus*.

Anatomic Diagnosis.—Multiple abscesses of left lobe of liver suppurative pyelephlebitis of branches of portal vein in liver suppurative phlebitis of superior mesenteric vein and its colic and ileocolic branches septic thrombosis of the portal vein with extension into the splenic vein (complete obstruction of portal vein) suppurative gangrenous appendicitis with perforation into an abscess of the root of the mesentery retrocecal abscess acute generalized serous peritonitis left serofibrinous pleuritis fibrinous epicardial patch multiple septic infarcts of the spleen lessened yellow material of adrenal cortices marked hyperplasia of the biliary lymph-glands moderate hyperplasia of the mesenteric lymph-glands abscess erosion of the serosa of the pyloric antrum of the stomach infarcted subperitoneal lobule of fat opposite the umbilicus thrombosis of one of the branches of the hemorrhoidal veins edema of the ankles hypodermic needle puncture wounds of the right arm disappearing hypodermic needle puncture wounds of the left arm hydropericardium cloudy swelling of the myocardium hypostatic hyperemia and edema of the lungs hyperemia and fatty change of the liver cloudy swelling and fatty changes of the kidneys moderate hyperplasia of the spleen hyperemia of the lining of the upper portion of the small bowel hyperemia of the lining of the lower portion of the rectum hyperemia of the lining of the gall-bladder hyperemia of the lining of the trachea and main branch small

petechial hemorrhages of the lining of the main bronchus of the left lung slight hyperplasia and coal-dust pigmentation of the peribronchial lymph-glands fibrinous and fibrous adhesions between the appendix and the cecum frothy fluid in the trachea and bronchi hyperemia of the tissues about the umbilicus healing surgical wound of the right epigastrium beginning sacral bed-sores decubitus ulcers of the skin of the trochanters slight sclerosis of the mitral leaflets moderate sclerosis and fatty change of the lining of the aorta slight fatty infiltration of the lining of the common carotid artery right fibrous pleuritis partial compression of the left lung fibrous adhesions between the gall-bladder and the transverse mesocolon, transverse colon, pylorus of the stomach, and parietal peritoneum fibrous adhesions between the mesosigmoid and the brim of the pelvis atrophic tonsils ossification of the laryngeal cartilages long absent teeth vaccination scars of the right upper arm scar of the right chest superficial scars about the left knee callouses of the toes scar of the left great toe disappearing hemorrhage of the left fourth toe false upper teeth impacted cerumen surgical dressings pedunculated verruca of the base of the penis, loss of pigment of the skin of the forearms, thighs, and legs patent intersigmoid fossa retrocecal appendix accessory coronary arteries accessory chorda tendineae of the left heart chamber membranous persistent eustachian valve moderate postmortem digestion of the lining of the esophagus postmortem digestion of the lining of the stomach postmortem discoloration of the mesentery of the small bowel.

Appendicitis has long been recognized to be a cause of pyelephlebitis and hepatic abscesses, but there is considerable difference of opinion as to the frequency with which this grave sequel occurs. The first description of a case in which pylephlebitic inflammation was followed by pus in the portal vein and liver abscesses is attributed by Lohmann to Waller in 1846. Ochsner scarcely mentions metastatic abscesses of the liver after appendicitis. Genster found it 9 times in 1187 cases of appendicitis operated on at the Mount Sinai Hospital in the course of ten years. Fitz found suppurating pylephlebitis in 11

cases of 257 cases of suppurating appendicitis, and in 2714 clinical cases of appendicitis collected from the various London hospitals there were 10 cases of suppurative pylephlebitis 0.4 per cent. Gibson found only 1 case of multiple abscess of the liver in 782 operations for acute appendicitis. Langdon Brown reported 12 cases out of 9494 necropsies or 0.12 per cent. Munro reported 9 cases of portal vein infection following appendicitis and goes so far as to say that hepatic abscesses occur in 5 to 10 per cent. of the cases of appendicitis. While pylephlebitis with multiple abscesses of the liver or lung is a very grave complication of appendicitis numerous cases with recovery have been reported (Hellstrom Kelley Scott, Barlow and Brugemann) Brogden reports a case with recovery after operation on the liver. This circumstance leads one to the conclusion that perhaps many cases which are never recognized recover. Bryant in necropsies on 20 cases of pylephlebitis at Guy's Hospital, found that in only 2 instances had the correct diagnosis been made during life. Of course, not all cases of hepatic abscess are due to appendicitis. Hart says that in 17 cases of liver abscess in which the infection was through the portal vein, occurring at the Presbyterian Hospital New York, 3 were found to have origin in the appendix. When one considers the anatomic proximity of the appendix and the liver it is to be wondered that liver abscesses and pylephlebitis are not more frequent. The appendical veins empty into the ileocolic vein the latter into the right colic vein, and that into the superior mesenteric vein which, in turn empties into the portal vein. This anatomic arrangement makes it practically certain that septic emboli from the appendix will lodge in the portal vein or the liver. It is generally thought that pylephlebitis may originate from appendicitis by 1 continued thrombosis 2 septic emboli which may be detached by (a) lack of firm adhesion of the thrombus to the walls of the vessels (b) loss of consistence of the thrombus due to septic deliquescence (c) mechanical factors acting from within or without the body (manipulations of a surgical operation, etc.) Other veins than the portal may be involved and the septic material may be carried as far as the lung. Gerster says

Large emboli may pass directly through the substance of the liver by means of large venous anastomoses existing according to Claude Bernard between the portal vein and the vena cava. I cannot find confirmation of this mechanism of transportation of emboli to the lung. There is the possibility that septic material could pass to the caval circulation by other routes. Piersol gives the collateral circulation of the liver as follows:

- 1 Gastric vein to esophageal veins, to azygos veins and hemorrhoidal veins.

- 2 Hemorrhoidal veins to the hemorrhoidal plexus, to the hemorrhoidal branches of the internal iliac.

- 3 Umbilical veins to supra-umbilical veins and to superior and deep epigastric veins, and so to the external iliac vein.

- 4 Veins of the falciform ligament to the phrenic veins.

- 5 Retroperitoneal anastomoses between peritoneal and mesenteric veins (veins of Retzius)

That the retroperitoneal lymphatics constitute another route of communication between the appendix and the liver was emphasized very ably by Monro in his paper before the Chicago Surgical Society in 1905. He says that lymphatic paths extend along the retroperitoneal space to the liver, diaphragm and thoracic regions. Furthermore, there is a connection between the lymphatics of the diaphragm and those of the peritoneum thus enabling infected material absorbed from the abdomen to enter the diaphragmatic lymphatics. He believes portal infection to be the commonest cause of intrahepatic abscess, but a lymphangitis may be coexistent. Some Europeans believe that liver and lung complications are far more frequent in cases which run for some time unrecognized or without operation. And it has been thought that infection of the portal vein is more liable to occur when an abscess has formed around the appendix and the pus is under pressure. The non-incision operation for appendicitis has been mentioned as a dangerous factor. The condition may occur where the appendix has not ruptured, and it has even been considered possible that so slight a disorder as chronic obliterative appendicitis may result in fatal pyelophlebitis.

Munro's conclusions are worthy of very thoughtful consideration. They are as follows:

1 Lymphatic and hepatic infections are more common than we believe.

2. The two infections are frequently associated and one type may be the source of origin of the other.

3 In certain cases of hepatic abscess the source of infection, whether through the portal canals or through the lymphatics, cannot be determined either clinically or at operation.

4 The type of infection does not depend upon the gravity of the originating appendicitis.

5 Subphrenic infections must not be isolated in a class by themselves as they depend on both lymphatic and hepatic infections, and vice versa.

6 Hepatic infections are not uniformly distributed even when originating in the portal tract, the left lobe being solely affected at times.

7 The prognosis of lymphatic (including subphrenic) infections is better than that of hepatic, but when the latter are secondary to the lymphatics or direct mechanical invasion the outlook is more favorable than in the true portal invasions.

8 The most important clue in making a diagnosis is the recognition of a causative appendicitis, and the elimination of this possible cause is necessary in dealing with obscure hepatic invasions in the presence of plasmodia, Widal reaction, etc.

While the differential diagnosis may be very difficult, perhaps the most important single symptom to be considered is the presence of chills followed by high temperature. The chills may exist before the operation and even before the development of the physical signs of appendicitis (five days before in Blatchly's case—Curtis) and may vary very greatly in number and intensity. They may occur several times a day the thermometer showing steep curves of relatively high rises and subnormal falls and then they may stop a day or two. The temperature curve contrasts rather markedly with the typhoidal or ordinary septic curves. Icterus is variable. Urobilin in the urine and diarrhea

have been mentioned and one author believes a striking feature to be the absence of the coated tongue.

As early as 1882 Chvostek called attention to the possibility of confusing pyelephlebitis with such thoracic conditions as pneumonia, empyema, and subdiaphragmatic abscess. Munro says that *'from the pneumonia or empyema especially if ushered in with abdominal spasm the distinction must be difficult and at times impossible*. Occasionally friction-rubs are heard over the dome of the liver due to the rubbing together of inflamed peritoneal surfaces. Or these may be audible over the right side of the chest from extension of inflammation through the diaphragm to the pleura. Pressure exerted by the enlarged liver may lead to bulging of the chest wall and to collapse of the lung simulating pleurisy with effusion. In some cases there may actually be a purulent effusion into the pleura and the lung may contain abscesses. It is not to be wondered at that such cases may be diagnosed as empyema or septic pneumonia. In pyelephlebitis there may be collapse and hypostatic congestion of the base of the lung. Abscesses with surrounding pneumonia complications may not be infrequent in neglected cases of appendicitis, and can be due to direct extension through the diaphragm or in rare instances, to general pyemia some pyelephlebitic abscesses having discharged into hepatic veins. Hall presents 14 interesting cases his first is a lung abscess. In his third case the symptoms of appendicitis were so slight that little heed was given them until the appearance of a lung abscess eight weeks later. His fourth case developed even pericarditis. The second case of Babler's series is very interesting. Twenty four days after operation there was pain in the right chest and three days later pus was aspirated. Although a piriation of the abscess gave temporary relief it finally ruptured into a bronchus and death ensued.

While surgical intervention offers some hope in cases of isolated liver abscesses, that is about the limit of its usefulness. Mention might be made of case cured by Barlow after the use of eusol intravenously.

The feature of outstanding interest in the present case is

that upon admission the physical signs and symptoms pointed to the lung and neither history nor physical examination indicated that the chief source of trouble was in the abdomen. There was history of having had influenzal pneumonia three weeks before entrance with the crisis two weeks after the onset, which was one week before the admission to the hospital. There is nothing in the autopsy findings which would contradict this history although the condition of the lungs showed there could have been no preceding lobar pneumonia in that length of time. The exact time of onset of the appendicitis can only be a matter of conjecture, but it seems very probable that it was *during* the pneumonia attack and before its crisis. The symptoms of pneumonia probably so masked those of the appendicitis that the latter were overlooked. The fact that in the week following the crisis there were seven or eight chills with sweating further points to this conclusion by suggesting that the pylephlebitis, which was of appendical origin already had occurred. The presence of lung signs may readily be explained as a residue of the preceding pneumonia, superimposed upon which were the changes in the pleural cavity brought about by extension of the infectious processes through the diaphragm from the liver.

The writer desires to thank Dr Halstead for permission to report this case.

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CLINIC OF DR. DAVID C. STRAUS

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AMPUTATION OF THE THIGH WITH DEMONSTRATION OF 3 CASES PRESENTING UNCOMMON INDICATIONS FOR ITS PERFORMANCE

Summary Demonstration of case of mal perforant dupied (perforating ulcer of the foot) due to peripheral nerve lesion case of tuberculosis of the knee-joint of thirty-three years duration in man of forty-five and case of painful stump due to an osteophyte following an old thigh amputation, with an analysis of these cases. Discussion of the technique of amputation of the thigh and some points in the after-treatment

THIS morning I wish to consider the subject of amputation of the thigh and present 3 cases that I have amputated within the last few weeks. All three amputations were done for conditions which do not ordinarily require such radical treatment.

The first case is one of mal perforant dupied (perforating ulcer of the foot). The patient, who is twenty-seven years of age has been in the hospital on two previous occasions because of an ulcer beneath his left heel and it was for this same condition that he returned this time. To fully understand the case it is necessary to go over his history from the time of an accident which occurred to him during his childhood. The history is unusually interesting and instructive.

He had no trouble with either leg until he was eight years of age when while running across a field one day he suddenly slipped and fell on some sharp object, sustaining a cut across the front of the right knee. There was a curved cut transversely across the front of the knee, just below the joint (Fig. 455). The skin was loose in a flap that could be lifted upward. The leg bled very freely but he was able to run home. This occurred

These cases were shown at the Clinical Meeting of the Chicago Surgical Society held January 7, 1921.

in Manchester England and he was at once taken to the Royal Infirmary. The wound was probed in an effort to find any glass or other foreign material, but nothing was found. He remained at the Infirmary for observation. Some days later a transverse



Fig. 455.—Photograph of both legs from in front (Case I). Note that the left leg is considerably shorter than the right and that the left foot is considerably smaller than the right. Note also the enlargement about the left ankle due to the arthropathy. The scar from the original injury is seen at *A*. The two scars (*B*) above the knee joint show the site of the lower transverse drainage-tube. *C* is the scar from the operation subsequently performed to straighten the knee, resection of the knee-joint. Following this, due to division of peripheral nerves during this operation, the trophic changes resulted, the most important among these being the anal perforator disease. This photograph was taken when the patient was in the hospital in July, 1920.

incision was made on the outer posterior aspect of the knee. After a few days more four additional incisions were made, a pair just above the patella, one on the anterolateral and one on the anteromedial surface of the thigh and a second similar pair

higher up on the thigh. A rubber drainage-tube was passed through each pair of incisions. He remained in the hospital for six months and then returned to his home. After leaving the hospital he had pain on weight bearing. Contracture of the knee-joint gradually developed. This progressively increased until finally the knee was held flexed at about a right angle. Later the pain was present only at times. This was the condition of the limb on his arrival in America when he was fourteen years old. On his arrival here he went to a hospital at Buffalo, New York, to have the leg straightened. A typical resection of the knee joint was performed and a plaster cast was applied from the ankle to the hip. Immediately following the operation he noticed that he had no sensation below his ankle and no control of the foot. The cast remained on for five months. During the first three months he was kept in bed, and during this time his foot was allowed to hang extended plantarward without any support. As a result a bed-sore developed on the plantar surface of the heel where the heel rested on the bed. From this history it is perfectly obvious that extensive destruction of the peripheral nerves occurred during this knee-joint resection, with a resulting typical drop foot. The bed-sore healed as soon as he got up from the bed. At this time he noticed that he could not put the heel on the ground due to contracture of the tendo achillis. To remedy this tenotomy of the tendo achillis was performed. Following the tenotomy he was able to put his heel on the ground but he had no control of the foot. Two months later, five months after the first operation, he was discharged from the hospital. The knee was ankylosed in extension, he had no control of the ankle, and there was anesthesia of the entire leg and foot except on the inner side of the leg from the knee to the ankle.

The condition remained unchanged for about eight years, when an ulcer developed on the heel at the site of the old bed-sore. The ulcer was about the size of a 50-cent piece, and he said he could put his finger into it and "it did not hurt a bit." A physician cut away all the necrotic tissue, and it was three months before the ulcer was healed. This ulcer never recurred.

About four years later he developed an extensive infection of the left little toe and half of the outer side of the foot. This healed after one month and remained healed. In March, 1919 he developed an ulcer under the left heel. It was for this that he came to the Cook County Hospital the first time. The hospital record shows that he had a typical trophic ulcer of the heel. After



Fig. 454.—Photograph of both feet, plantar view (Case I). Note that the left foot is considerably smaller than the right and shows the perforating ulcer below the heel. Note the hyperkeratosis of the skin about the ulcer crater producing the elevated and thickened margin. Note also the trophic changes of the nails, which are greatly thickened, more curved than normal in both diameters, as compared with those of the other foot, and sometimes. The skin shows other evidence of trophic change as the callus noted beneath the great toe and beneath the anterior portion of the foot.

remaining in bed a week and a half the ulcer healed and he was discharged. About three months later the ulcer recurred but as it caused him no pain he allowed it to go untreated until July 1920 when he again returned to the County Hospital, this time on my service. Examination on admission showed the following

The left knee-joint was ankylosed and painless and the leg below the knee was greatly shortened and showed marked atrophy (Fig. 455). The scars from the previous operations were plainly visible. The left foot was considerably smaller than the right and showed a perforating ulcer below the heel and other trophic changes such as marked atrophy of the foot, marked trophic changes of the nails which were greatly thickened and curved (Fig. 456) and total anesthesia of the sole of the foot. The ulcer beneath the heel was a typical perforating ulcer (Fig. 456). The ulcer crater was about the size of a 50-cent piece and extended deeply into the soft parts. The walls of the ulcer were very thick and showed a marked hyperkeratosis of the skin. The ulcer was entirely anesthetic and a probe inserted into the crater reached to the os calcis which similarly was devoid of sensation. There was some redness of the soft parts about the ulcer and the patient had a temperature of 103° F. A complete physical examination was entirely negative except for the local condition. In order to rule out the possibility of a luetic infection evidences of syphilis were particularly looked for but none were found. A roentgenogram was ordered. I believed this temperature was probably due to the infection about the ulcer and consequently had hot wet dressings applied.

The roentgenogram of the foot (Figs. 457-458) showed the typical picture of an arthropathy. The lower end of the tibia and fibula showed definite sclerosis with new bone formation and osteophytes. The articular portion of the astragalus likewise showed an increased density with new bone deposit, so that the ankle-joint showed a definite widening of the articular surfaces. The picture was similar to that seen in a beginning arthropathy due to tabes, paresis or syringomyelia. There is no particular difference in the roentgenologic appearance of the *arthropathy* that develops in any of these conditions but the roentgenologic finding of an *increase in density* of the bone in these conditions is of definite value in differentiating these arthropathies from other conditions with which they may be confused. The most frequent condition of the ankle joint that must be considered in differential diagnosis is *tuberculosis* and

here the characteristic roentgenologic finding is a *decrease in density* of the bones forming the joint. The lower surface of the os calcis showed a spur down to which the perforating ulcer reached as is usual in these cases.

From the history of the anesthesia and the loss of control of the foot coming on immediately following the resection of



Fig. 457—Roentgenogram of left foot, lateral view taken while the patient was in the hospital during July 1920. This shows the typical picture of an arthropathy. The lower end of the tibia and of the fibula show definite sclerosis, with new bone formation and osteophytes. The articular portion of the astragalus iliacus shows an increased density with new bone deposit, so that the ankle joint shows definite sclerotic widening of the articular surfaces. There is a spur on the lower surface of the os calcis, down to which the perforating ulcer reached, as is usual in these cases. The dorsal surface of the posterior portion of the os calcis shows osteophyte formation.

the knee joint it was clear that these changes were due to a *division of peripheral nerves* at that operation. The bed-sore that developed while he was still in the hospital may have been for the most part purely decubitus ulcer though it was probably a combination of both pressure and trophic change. The ulcer that appeared later at the same site was probably purely

a trophic manifestation. The infection of the little toe and almost half of the foot probably began from an injury with a resulting infection both of which were unnoticed because of the



Fig. 453.—Roentgenogram of left foot and ankle, anteroposterior view taken while the patient was in the hospital in July 1920. This shows the arthropathy of the ankle joint and, in addition, periosteal thickening of the opposing sides of the lower end of the tibia and of the fibula, due to previous infection from the perforating ulcer with resulting cellulitis and periostitis.

local anesthesia, and progressed to such a marked extent because of the poor nutrition due to trophic changes. Certainly the extensive destruction that resulted was related to the nerve lesion.

Under local treatment with hot moist dressings and rest in bed the temperature returned to normal, but the ulcer refused to heal. Consequently I decided to excise the ulcer and cut away the greatly thickened and sclerotic margins so as to improve the circulation and allow the ulcer to heal by granulation. This was done in the following manner:

Without the use of any anesthetic the greatly thickened margins of the ulcer were widely excised well into normal tissue cutting through all the soft parts down to the os calcis. This left a defect about 7 cm. in diameter. The entire wound was swabbed with tincture of iodine. In order to close this the margins of the incision were widely undermined and then approximated as well as possible by means of interrupted silk worm-gut stitches placed transversely to the long axis of the foot. A considerable gap still remained. This was allowed to close by granulations. By July 8th the wound had completely filled in and the patient was discharged from the hospital in good condition, walking with the aid of crutches. Before leaving the hospital it was explained to him that the ulcer would probably recur and that if it did he ought to consider allowing the leg to be amputated, as it would always be a source of inconvenience and danger to him.

Three weeks after leaving the hospital (July 29, 1920) while walking on the street one day he slipped and fell hitting his heel on the pavement. The recent scar was torn open. He returned to the hospital the same night and was again admitted to my service. He was in great pain and had a temperature of 101° F. Hot moist dressings were again applied. Considering the fact that this rise in temperature followed within a few hours after the fall, it was perfectly obvious that it could not have been due to an infection developing at the time of the accident, but must have been due to the lighting up of infection that had been quiescent. Also his history showed there had been several previous similar flare-ups after trivial injuries to the leg. By the following morning his temperature had risen to 103.2° F and by that night reached 104.6° F due to severe cellulitis of the foot, ankle and lower leg with purulent arthritis of the

ankle joint. It was necessary to resort to multiple incisions to drain the soft parts and typical drainage of the ankle-joint. The temperature remained above 104° F until August 1st. On August 1st it was 103.6° F August 2d, 103.8° F August 3d the day of amputation it was 102.4° F at 3.34 A. M. As the pus continued to discharge freely and the temperature remained up I decided to amputate.

In order to determine the amount of bone involvement and whether or not osteomyelitis of the tibia or fibula was present, a roentgenogram was ordered. The plate showed a total obliteration of the ankle joint due to the old joint resection and the two wire loops that were inserted at that time to hold the femur and tibia in apposition. There was a marked deposit of new periosteal bone about the shafts of tibia and fibula for almost their entire length, a typical periostitis, and in their lower 20 cm this newly formed bone filled the entire interosseous space between the tibia and fibula. Above this there were irregular dense shadows suggesting sequestration or ossification. The ankle joint showed marked bone damage due to the suppurative arthritis. The os calcis showed sclerotic changes typical of an osteo-arthropathy.

Operation.—Accordingly on August 3 1920 the leg was amputated. The amputation was made at the lower third of the femur using a longer anterior flap and a shorter posterior flap. The amputation was so planned as to leave as much of the normal portion of the femur as possible and still cut the anterior flap so that its lower margin was definitely above the old drainage incisions just above the patella, in order to make the amputation through as nearly normal tissue as possible. An apertosteal amputation was performed. A consideration of the type of flaps to be cut, the location and length of the flaps and the site at which the bone is divided and the treatment of nerves and vessels in any particular case will be discussed later. A rubber drainage tube was inserted transversely across the lower angle of the stump.

Following the operation his highest temperature was 101.8° F and after the fourth day it never reached 100° F. It returned

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better than he can ever remember feeling since he was a boy. He is now working all day and states that at night he is not at all tired out. He is wearing an artificial leg and says he has not the least pain or discomfort in the stump.

Dissection of the amputated leg showed that the ankle-joint had been well opened. There was free thick yellow pus in the joint cavity as well as in the soft parts about the ankle. There was a zone of soft, rough bone moth-eaten in appearance about the entire periphery of the articulating surfaces of the ankle joint. This was about 1 cm. in width. The cartilage of the internal half of the trochlear surface of the astragalus was loosened, while over the posterior half of this region there was red granulation tissue. Removal of this loose cartilage exposed a spherical cavity in the astragalus 2 cm. in diameter with a ragged bony wall and soft, necrotic grayish-green content. The internal malleolus showed some absorption and the outer half of the lower epiphysis of the tibia was rough and softened while beneath the periosteum a hemorrhagic exudate extended upward 10 cm. on the inner surface of the tibia.

The tibia and fibula were joined in their lower 20 cm. by compact bone 1 cm. thick, which replaced the interosseous membrane. Both in front and behind this formation from the ankle up as high as the level of the head of the fibula, the muscular tissues were infiltrated with soft, white, opaque putty-like material in some places ossified. The muscle bellies were soft and friable while their tendons were white and frayed on cutting. The putty-like material infiltrated the periosteum which was thickened, but did not invade the bone. There was marked atrophy of the gastrocnemius and soleus.

The resected knee-joint was completely ankylosed. The patella was absent. The femur and tibia were joined by bony union. In the midline in front was a continuous wire suture which penetrated 2 cm. into the bones. On the internal margin of the femur was a similar wire suture.

On complete dissection of the arteries, veins and nerves all were found unchanged macroscopically.

On longitudinal and cross-sections of the tibia and fibula,

to normal a week after the operation and remained normal after that.

In order to obtain a painless stump the Hirsch method of after-treatment was employed. This will be discussed in detail when considering the technic and management of thigh amputa-



Fig. 459—Photograph of amputation stump, Case I, taken shortly before his discharge from the hospital. The stump is flexed, and for this reason appears shorter than it was in reality; and for the same reason, also, the scar appears to be at the end of the stump, because it is located posteriorly as is suggested—the lateral portion of the end of the stump. The end of the stump consists of practically all the tissue included in the oval bounded above by the lower portion of the crowing of the T where adhesive plaster had been applied.

tions in general. The wound healed by primary union. The patient was walking about the ward on the tenth day after operation. He was discharged from the hospital on August 28th, with good and painless stump (Fig. 459). He has gained greatly in weight and strength, and at present says he feels

article in the *Ergebnisse der Chirurgie und Orthopädie* 1914 pp 909-930 with a report of 19 cases pointed out that all his 19 cases occurred in men. Furthermore, it occurs almost always in working people who are on their feet a great deal and the ulcer occurs at points of pressure on the plantar surface of the foot. There are three typical sites where the ulcer occurs. These are beneath the metatarsophalangeal articulation of the great toe, beneath the fifth toe, and beneath the heel.

In the course of time four theories of origin have been brought forth. These are First, the *mechanical* theory second, the *vascular* theory third, the *nervous* theory fourth, the *arthropathy* and *osteopathy* theory.

The *mechanical theory* may be dismissed with very few words. While pressure and trauma unquestionably are important in determining the site and development of the ulcer these mechanical factors must be regarded as only contributory and not as the underlying cause. It may be pointed out that a perforating ulcer may occur in areas not subjected to pressure or other mechanical trauma, and that the ulcers are frequently not cured by rest in bed, and may even grow progressively worse.

The *vascular theory* assumes a chronic vascular disease an obliterating arteritis is the underlying cause. This theory is no longer held. Arteriosclerotic changes, when present, are looked upon as a mere coincidence in most cases. Usually there is no or but very little arteriosclerosis. When present and limited to the area about the ulcer as sometimes is seen, the arteriosclerosis is probably the result and not the cause of the disease.

The *nervous theory* is based upon the belief which is generally accepted today that the chief factor in the pathogenesis is some change in the nervous system. The underlying nervous lesion may be located in the central nervous system or in the peripheral nervous system. It results in sensory, motor and trophic changes which may affect the nerves of the entire limb or be limited to the portion of the nerves immediately in the vicinity of the ulcer. The changes are either a parenchymatous or an interstitial neuritis. The following types and causes of peripheral neuritis may lead to the development of *mal per*

calcaneus, astragalus, tarsal, metatarsal, and phalangeal bones, no further changes were found.

This examination showed that we were dealing with a chronic suppurative arthritis of the left ankle-joint with extension through the articular cartilage and secondary acute osteomyelitis of the astragalus and chronic suppurative periarthritis, chronic ossifying periostitis of the tibia and fibula with replacement of the interosseous membrane by compact bone calcification and caseation of the soft tissues and muscles of the front and back of the leg; atrophy of the muscles on the back of the leg. Examination of the knee showed a total obliteration of the knee-joint. The lower end of the femur and upper end of the tibia showed the typical picture of a joint resection, with bony union between the apposed ends of the femur and tibia. The two wire fixation sutures noted in the roentgenogram were exposed and the one at the middle of the line of junction of the two bones showed a cavity about the wire.

Mal Perforant Du Pied.—In connection with this first case it may be of interest to briefly review the pathogenesis, clinical picture, and course of *mal perforant du pied* together with the prognosis and surgical indications, and, in particular to consider when amputation is indicated.

We are indebted to the French for our first knowledge of the condition, and it is usually referred to under the French name. From the time of Nélaton, who published a paper on the subject in 1852, the French literature contains many articles on the disease. Poncet in 1872 was the first to recognize the relation of the condition to disease of the nervous system and it was shortly after this that the relationship between diseases of the spinal cord particularly tabes, and perforating ulcer of the foot was established. There has always been considerable difference of opinion in regard to the pathogenesis of the condition, but it is now well established that it may result from several very different causes.

It occurs chiefly in males, and usually in men over forty years of age. It is very rare in the young, though 2 cases have been reported in children. Max Höffmann in an excellent

(a) A pressure callus develops at one of the sites of election—under the ball of the great toe, ball of the small toe or under the heel. This is always suspicious in a case that presents some lesion of the spinal cord or of a peripheral nerve, which experience has shown is commonly accompanied by *mal perforant du pied*. This primary callus does not differ from an ordinary callus, and is merely a localized hyperkeratosis. From this callus alone it is not possible to make a positive diagnosis of a beginning perforating ulcer though if a roentgenogram of the foot be taken and this shows the presence of an arthropathy or an osteopathy a presumptive diagnosis can be ventured.

(b) A little later this horny layer becomes thin at the center.

(c) Secretion collects beneath the thin scar.

(d) Finally the thin covering horny layer ulcerates through at its center and gives rise to a small superficial ulcer. This ulcer shows no tendency to heal. It may epithelialize, but then it breaks down again. Gradually the ulcer grows deeper and deeper and broader and broader. It maintains its round form and is surrounded by a wall of greatly thickened epidermis. The ulcer secretes a thin watery fluid. If later secondary infection of the ulcer takes place the ulcer may secrete foul pus. The ulcer is painless, as a rule and this is typical. Usually there is more or less anesthesia of the skin about the ulcer even when no other evidence of a nerve lesion is present. Pain or tenderness if present in the skin about the ulcer speaks against the correctness of the diagnosis. Other (trophic) changes are often present as trophic changes of the nails (as in this case Fig 456) localized thickening of the skin epithelium in other places, as on the dorsum of the foot local changes in the amount of sweat secreted, either increased decreased, or absent and finally and most important, trophic changes in the overlying or adjacent bones or joints. Duplay and Moret as early as 1773 pointed out that primarily erosions of the cartilage of the neighboring joint are observed, with later destruction of the joint, ankylosis, and the formation of a fistula. It is common on probing a perforating ulcer to find that the probe follows upward through a fistula that enters the neighboring joint and that the probing is en

ferant Traumatic neuritis irrespective of the nature of the trauma tumors of the nerves, tumors that press upon the nerves, pressure upon the nerves by callus, etc., alcoholic neuritis, neuritis following freezing or burns, neuritis of leprosy etc. The *anesthesia* seems particularly to favor the development of a perforating ulcer

Changes in the central nervous system apparently play a more important rôle, particularly *tuberculosis*. Other important causes are damage to the cord due to fractures of the vertebrae, tumors of the cord *spina bifida* with its associated cord changes, and *syringomyelia*. Less frequent causes are *paralysis*, progressive muscular atrophy amyotrophic lateral sclerosis, and spastic spinal paralysis.

The nervous theory of origin is apparently substantiated by the frequent finding of neuropathic arthropathies associated with perforating ulcers of the foot.

Although typical perforating ulcers of the foot have been reported in diabetics, the typical diabetic ulcer differs from the typical *mal perforant*. The diabetic ulcer is usually painful, whereas the typical *mal perforant* is characterized as a rule, by the entire absence of any pain.

The *arthropathy* and *osteopathy* theory was recently suggested by Levy who believes that the arthropathies and osteopathies are the cause of ulcer formation. Serious objections have been raised against this theory. The bone and joint changes (arthropathies and osteopathies) found associated with perforating ulcers of the foot, like the ulcer are due to changes in the nervous system. These bone and joint changes in some cases come on before the ulcer appears in other cases they develop simultaneously with the development of the ulcer and in still other cases they do not occur until after the ulcer has made its appearance.

It is clear that the causes of the ulcer are multiple that the nervous factor is the most important, and that pressure and trauma are important contributing causes in determining the site and development of the ulcer.

The clinical picture in a typical case is about as follows

etiologic factor where this is possible as in arteriosclerosis, alcoholic neuritis, lues, etc. This is particularly important in peripheral nerve lesions as compression by callous neuritis.

Without going into details as to the local treatment, the following methods have been reported by various authors as having proved of benefit in certain cases the use of constant and induced electric currents x-ray treatment locally high frequency currents hot-air treatment nerve stretching paraffin injections to broaden the pressure surface, etc. It is essential to keep the patient off his feet during healing and to keep all pressure off the ulcer. It is best to keep the patient in bed. The ulcer must be dressed aseptically and kept clean.

Lasting results can be achieved only by surgical intervention. In cases in which no connection exists between the ulcer and the neighboring joint or bone careful and complete excision of the ulcer going well into healthy tissue, is all that is required. This can usually be done as in this case, without the use of any anesthetic as there is usually total anesthesia of the tissues about the ulcer. If the ulcer is very superficial it may suffice to excise merely the thickened epidermis that forms the margin of the ulcer. But it is best to dissect off the floor of the ulcer in order to determine whether there is not a communication with the adjacent joint. For this reason it is best to operate with a constrictor applied. In case one finds that the ulcer communicates with the joint or bone all destroyed bone should be removed so as to have the conditions most favorable for a cure and guard against a recurrence.

Occasionally secondary infection of so extensive a nature develops as to threaten the patient's life. Here more radical operations are required. It is only rarely however that amputation is indicated as in this case. *Amputation is most often indicated in perforating ulcers due to a lesion of the central nervous system as tabes paresis syringomyelia spina bifida etc for in these conditions simple excision is usually followed by recurrence.* If after the proper local treatment or excision the ulcer recurs, small amputations, as of a toe or part of the foot, or low amputations of the leg are allowable but must be followed by careful

tirely painless. And it is certain that the bone and joint changes and the perforating ulcer have a common cause, and that is nervous in origin. Rotter, Volkman and Virchow believed that the ulcer was the cause of the arthropathy. Today however most authors believe that the arthropathy is the result of a central or peripheral nerve lesion. As mentioned before, Levy believes that the changes in the bone and joint are the cause of the ulcer.

As regards differential diagnosis the following ulcerative conditions have to be ruled out: Tuberculous ulcers, luetic ulcers, ulcers of leprosy, diabetic ulcers, fistula from suppurative bursitis, atheromatous ulcers, ulcerated sarcoma, and carcinoma.

The roentgenologic findings are often of great value in the differential diagnosis. The absence of bone atrophy in *mal perforans* is typical and stands out conspicuously in contrast to the marked destruction of the ends of the bones at the joint. Bone atrophy may develop later from disuse but in cases of doubt as to the correctness of the diagnosis of *mal perforans* this absence of bone atrophy may decide the diagnosis, as, for example, against tuberculosis. In the case of our patient with the ulcer beneath his heel, the roentgenograms (Figs. 45-458) show changes in the ankle-joint in the form of an arthropathy; you can see the new bone deposited and the widening of the joint surfaces which have become somewhat irregular and at the same time not that there is no bone atrophy of the shaft of the tibia or fibula—indeed, these are thickened by a circular periostitis. Both tuberculous ulcers and diabetic ulcers are characteristically painful, in contrast to the absolute anesthesia of the ulcer in *mal perforans*.

The prognosis of *mal perforans* is bad as to cure. The ulcer is difficult to heal and tends to recur. It predisposes to suppurative arthritis, lymphangitis, erysipelas, cellulitis, sepsis, and gangrene of the toes and foot. Hoffman reports that 2 of his 19 cases died of infection.

As regards treatment, one must not only treat the local condition, the ulcer, but wherever possible treat the underlying causal condition as well. Treatment must be directed to the



Fig. 460.—Photograph of both legs, Case II, anterolateral view taken with leg shaved for operation. The left lower extremity shows atrophy of all the muscles and the knee fixed in flexion at an angle of about 130 degrees. There is a typical spindle-shaped swelling at the knee, with subluxation of the leg backward, so that the line of the tibia, instead of meeting that of the femur at the knee-joint, cuts through the junction of the middle and lower third of the femur. This posterior subluxation and external rotation can be seen even more plainly in Fig. 461. There is also typical external rotation of the leg. Both the posterior subluxation and the external rotation are typical findings in tuberculosis of the knee-joint of long standing, in which marked excudation has occurred in the joint, with resulting relaxation of the joint capsule and ligaments. The weight of the leg produces backward sagging and the weight of the foot an outward rotation of the leg. There are two fistulae in relation to the knee-joint, both on the medial side, one 11 cm. above and the other about 2½ cm. below the joint line. The discharge from these fistulae can be plainly seen trickling down the leg.

after treatment and avoidance of weight bearing. These low amputations usually heal readily, but the ulcer is likely to recur within two or three months. Bland Sutton reported a case in which re-amputation had to be repeated several times in a patient suffering with perforating ulcer first on one foot and then on the other. In his case, one of spina bifida, seven amputations were performed and even then without cure. Perhaps in such a case, *if a low amputation is followed by recurrence it may be advisable to do the second amputation at once high up through the thigh* as suggested by Petersen (Deutsche Chirurgie, Lieferung 29a, p. 70).

Case II.—The second patient is a laborer forty-five years of age who came to the hospital November 18, 1920 because of stiffness and pain in the left knee and two discharging sinuses, one above and one below the knee-joint. He also complained of swelling in the right groin and scrotum.

The trouble in the knee began thirty-three years ago following a slight local trauma. Immediately following this a swelling appeared and some pain. In four or five days the swelling began to subside but for seven years there was some stiffness of the knee, but no great disability or discomfort. Then without any assignable cause, the knee again began to swell and considerable pain developed. He accordingly consulted a physician. An incision was made and caseous material discharged. The wound did not close for three months. Following this the joint became stiff and has remained so ever since. Occasionally the knee would swell up but the patient was able to work as laboring man on a farm and in a shop. Four months ago a sinus appeared on the inner side of the leg below the knee (Figs. 460-461). This discharged a light yellow thick foul pus which has continued up to the present time. A few months ago some pieces of bone were discharged. The knee became so painful that the patient was unable to work, and for this reason came to the hospital. Otherwise the history shows nothing of interest except for the fact that he is troubled with night-sweat.

Examination on entrance showed that the patient was a well-nourished man who did not appear ill. The findings of

region, in addition to being fusiformly enlarged was slightly red, but showed no increase of local temperature. The patella was firmly ankylosed and the knee-joint showed bony ankylosis.

From the findings the diagnosis was obvious—tuberculosis of the right knee. In order to determine the exact extent of the disease roentgenograms were taken. These (Figs. 462-463)



Fig. 462.—Roentgenogram of left knee-joint (Case II) antero-posterior view. This shows the typical picture of tuberculosis of the knee-joint in case of long standing. Note the old destructive arthritis of the knee-joint, with total obliteration of the joint. The lower end of the femur shows an area of absorption at the internal condyle, extending upward and involving the epicondyle. Note also the secondary arthritic deformations of the joint, which is evidenced by widening of the joint surface due to new bone deposit. This is particularly striking at the lateral margin of the joint surface. There is a marked new deposit of bone on the lower end of the femur and on the upper end of the fibula, with marked lipping. The bone atrophy typical of tuberculosis is well shown.



Fig. 463.—Roentgenogram of left knee-joint (Case II), lateral view. This also shows total obliteration of the knee-joint. This view shows particularly all the typical lamellar apposition (periosteitis) about the metaphysis of the femur found characteristically in tuberculosis of the long bones. New bone deposit is seen on the patella. The lipping described in Fig. 462 can be all seen posteriorly.

interest were a few palpable cervical lymph-glands on both sides the fact that the chest was long, thin and flat, with expansion only fair—that the lungs showed excursion fair slight impairment of resonance over the right apex and right upper lobe with harsh breath sounds over this area and prolonged expiration, but no rales—apparently an old healed tuberculosis of the right upper lobe. Heart findings were normal. There was a slight scoliosis to the right in the lower thoracic region. Abdominal examination was essentially negative. The left lower extremity showed atrophy of all the muscles and the knee fixed in flexion at an angle of about 130° F (Figs. 460-461). There was a typical spindle-shaped swelling at the knee with posterior



Fig. 461.—Photograph of left leg taken just before operation, lateral view. This shows particularly well the subluxation of the leg backward and the external rotation of the foot. Note also the fistula described in Fig. 460.

subluxation of the leg so that the line of the tibia instead of meeting that of the femur at the knee joint cut through the junction of the middle and lower third of the femur. Also there was a typical external rotation of the leg (Figs. 460-461). Both the posterior subluxation and the external rotation are typical findings in tuberculosis of the knee-joint with marked exudation into the joint. This causes relaxation of the joint capsule and ligaments. The weight of the leg produces a backward sagging and the weight of the foot an outward rotation of the leg (Fig. 461). There were two fistulae in relation to the knee-joint both on the medial side, one well above and the other about 2½ cm. below the joint line (Figs. 460-461). The entire knee

The temperature chart showed a normal temperature with only one reading of 99.4° F. Pulse ranged from 66 to 96, being usually from 72 to 80. Respirations were 18 to 20.

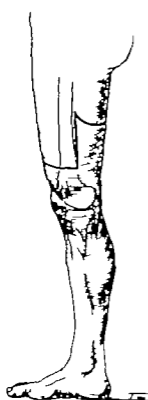


Fig. 464.—Diagram showing method of cutting flaps in amputation of the thigh in cases with marked trochanteric soft parts.



Fig. 465.—Photograph of amputation stump (Case II) taken shortly before the patient was discharged from the hospital. The stump is flexed, and for this reason appears shorter than it was in reality. The end of the stump is directed toward the camera. The scar is located posteriorly, away from the end of the stump.

The case is interesting from the standpoint of surgical indications as regard treatment. Ordinarily the usual treatment for advanced tuberculous gonitis (tuberculosis of the knee joint)

showed an old destructive arthritis of the knee joint with total obliteration of the joint. The lower end of the femur showed an area of absorption at the internal condyle (Fig 462) There was typical *lamellar apposition* (periostitis) at the metaphysis of the femur (Fig 463) as is found characteristically in tuberculosis of the long bones. The tuberculous changes in the end of the femur are seen to extend for some distance upward into the lower portion of the shaft of the femur. In ordinary purulent osteomyelitis the periostitis is characteristically amorphous, that is, shows no structure and has been compared to plaster thrown against the bone, and it extends more or less up the diaphysis and circularly about it. In tuberculosis of the long bones on the other hand the new bone formation, *ie* apposition, is usually only slight, occurs only where the diaphysis passes over into the epiphysis, that is, at the metaphysis, often occurs only in relation to the tuberculous bone focus and not entirely around the bone and is deposited during the exacerbations of the disease and this gives it a lamellar structure. These features are quite typical and allow one to differentiate it very readily from ordinary purulent osteomyelitis.

Bacteriologic examination was made from the pus obtained from the fistula. Smears failed to show any tubercle bacilli, but one does not expect to find tubercle bacilli in fistulae from tuberculous bone foci. Cultures showed streptococci. When a tuberculous bone abscess ruptures to produce a fistula it is the rule that secondary infection develops. This is usually either a staphylococcal or streptococcal secondary infection.

Blood examination showed hemoglobin 80 per cent red blood count 4,000,000 white blood count 6000. This low white blood count, leukopenia, is characteristic of tuberculosis. A differential white blood count showed small mononuclear lymphocytes 40 per cent, large mononuclear lymphocytes 8 per cent polymorphonuclear neutrophils 50 per cent eosinophils 2 per cent. This relative increase in lymphocytes with a relative decrease in polymorphonuclear neutrophils is also characteristic of tuberculosis. Urinary examination was entirely normal. Amyloid casts were especially examined for but none were found.

material. The discharge continued but varied in amount from day to day and was always more bloody than purulent. Because of the local tenderness the patient was unable to wear his artificial limb and it was for this reason that he entered the hospital.

He was well nourished and did not appear ill. There was nothing of interest in the general examination except the local findings. The left leg had been removed a short distance above the knee. The amputation stump was rather conical (Fig. 466). The end of the femur was covered by skin only



Fig. 466—Photograph of old conical amputation stump, Case III showing fistula does not osteophyte show in Figs 467-468.

The anterior surface of the end of the femur similarly was covered only by skin (Fig. 467) the flexor group of muscles ending a short distance above the end of the bone. Posteriorly, the extensor muscle group extended to the end of the femur. In the central portion of this muscle mass and a few centimeters above the end of the stump a depressed area was seen in which the fistula ended externally (Fig. 466). The skin about the fistula was somewhat red and infiltrated. The corresponding regional left inguinal glands were enlarged and tender. Palpation in the region of the fistula disclosed the presence of an osteophyte extending almost to the skin.

resection of the joint. Amputation is rarely indicated. *The indications for amputation in cases of tuberculosis of the knee-joint are:* 1 Marked general weakness—here the benefit to the patient of removal of this large focus of tuberculosis may give him the opportunity of turning the balance in his favor. 2 Multiple foci of tuberculosis, severe phtisis, amyloid, etc. 3 In old people over fifty years of age, unless they are too weak to stand amputation. 4 Too marked destruction of the knee to permit of resection. 5 Infiltrating type of tuberculosis, extending into the diaphysis. In this patient, his age, forty-seven years, and the extent of the disease gave the indications for amputation. Resection would have been impossible.

A typical aperiosteal amputation of the thigh with a longer anterior and a shorter posterior flap was performed November 30 1920. In order to cut the anterior flap well away from the fistula above the knee-joint and to divide the femur well above the tuberculous process in the bone the amputation had to be made through the middle third of the femur. On account of the marked atrophy of the thigh the flaps were cut rather rectangularly (Fig. 464). A drain was inserted across the lower angle of the stump. This was removed on December 3d. Following the operation he was given the Hirsch method of after treatment. He left the hospital on January 8 1921 with an entirely healed, completely painless, and good end-bearing stump.

Case III.—The patient, T. Z., a laborer thirty-nine years of age entered the Cook County Hospital November 27 1920 because of a bloody discharge and tenderness at the end of an amputation stump of the left thigh. The leg was amputated eight years previously because of a severe cellulitis of the leg which had been present for about one year. The patient does not know the exact nature of the trouble but he says the foot was greatly swollen at first the nail of the great toe and later the entire great toe was removed, and finally the leg. From the time the leg was amputated until five months ago the patient had absolutely no trouble with the stump. Five months ago the end of the stump became tender, red, and swollen. Some days later there was a spontaneous discharge of bloody and purulent

osteophyte and complete removal of the fistulous tract. In view of the fact that the stump was a conical one it was decided to resect the terminal portion of the femur well above the osteophyte in order to be able to bring the muscles over the end of the bone.

The patient was operated upon December 7 1920. With the patient drawn down to the end of the table, so that the intact knee was bent and the sound foot rested on a stool, the stump was held vertically upward and an Esmarch constrictor applied



Fig. 468 — Photograph of lower end of old amputation stump of femur removed at operation, showing the osteophyte (Case III)

high up. Then, with an ordinary scalpel, an anterior long flap and a posterior shorter one were mapped out, sacrificing as little skin as possible and yet cutting away the skin which was adherent to the end of the femur and in back, the skin about the fistula. When the muscles were exposed care was taken not to sacrifice any muscle except immediately about the fistula. An anterior and a posterior muscle mass were thus exposed with very little bleeding. The stump of the sciatic nerve was seen with a moderate bulbous swelling at its end but this was deemed unnecessary to resect. The bone now being well exposed all

A roentgenogram (Fig. 467) showed a typical osteophyte from the middle of the posterior surface of the end of the stump extending almost to the skin. The fistulous tract extended from the tip of this osteophyte out to the skin. There was no evidence of osteomyelitis of the stump of the femur.

From the clinical and roentgenologic findings it was clear that the sequence of events had been as follows: The osteophyte



Fig. 467—Roentgenogram of old amputation stump (Case III) showing osteophyte, from which fistula extends to the skin on the posterior surface of the stump, as shown in Fig. 466. Note that the end of the femur is uncovered by muscle.

had developed from the end of the stump and had grown until it reached almost to the skin. The pressure of his artificial limb against the osteophyte had resulted in the formation of a small ulcer due to pressure necrosis, with the subsequent development of a secondary infection and a resulting fistula.

The surgical indications were obvious—the removal of the

risk very materially and that often the condition of the patient does not warrant or demand it that when amputation has been done so that the femoral stump is less than 2 inches as measured from the pubis, the end of the bone projects laterally and that a padded shelf upon which this can rest may be made in the artificial limb which gives a comfortable and much more useful artificial limb than if the head of the bone were removed.

Where the disease or damage to the bone or soft parts makes it necessary to amputate above the condyles, the method I prefer under ordinary circumstances is the use of a long anterior flap and a shorter posterior flap. Many surgeons believe that in thigh amputations a long antero-external flap and a shorter postero-internal flap give the best stump. These flaps are cut through as nearly normal tissue as possible. When one has to amputate through infected or doubtful tissue very short flaps or even the guillotine method may be indicated, as in war surgery.

As the 3 cases demonstrated this morning presented local conditions indicating amputation above the condyles, I shall discuss this method in detail.

The operation is ordinarily best conducted under general ether anesthesia. Where the patient is in moderate shock, it is usually best to delay amputation until he has had time to recover from the shock. However in some cases where patients have been operated upon in slight shock the removal of the damaged extremity has been followed by recovery because the condition producing the shock has been removed. In rare cases where the patient is brought in in profound shock, suffering with a severely mangled extremity and his condition does not rapidly improve and where one would not attempt an amputation under general anesthesia one may consider using a spinal anesthesia in order to combat the shock by cutting off the afferent nerve impulses. In case the patient's general condition improves one may then resort to amputation. I recall one case of a boy who had been run over by an automobile truck which had torn off an enormous amount of skin from his lower abdomen buttocks and thigh, and caused a compound fracture of his femur. He was brought into the hospital in profound shock but was conscious though pulse

about, and holding the muscles well retracted to allow the saw to be used, the distal 6 cm. or so of the femur (Fig. 468) were cut away by means of a Helfferich saw. After this end of the femur had been removed, the distal 1 cm. of the periosteum and the distal 1 cm. of the medulla of the femur were removed. The constrictor was now taken off. There was no special bleeding. The muscles were sewed together over the end of the bone by means of interrupted chromic catgut stitches and the skin was closed without drainage.

Postoperative course was uneventful; the wound healed by primary union. In order to obtain a painless stump the Hirsch method of after treatment was carried out. This will be referred to later. The patient left the hospital on December 23d, and by this time was able to wear his old artificial limb. On January

1921 he was requested to appear before a clinical meeting of the Chicago Surgical Society. He came to the meeting but by mistake took the wrong street car and he walked over one mile to the hospital, and without pain or injury to his stump. This was four weeks after the amputation.

Technic of Amputation of the Thigh.—The technic of amputation of the thigh depends on several factors. As a general rule it may be stated that, so far as the local conditions permit, as much of the femur as possible should be saved. In other words, it is of distinct advantage to have the stump of the femur as long as possible. The Gritti-Stokes is probably the best amputation at the knee. Above the condyles end-bearing decreases the shorter the femoral stump and leverage likewise progressively diminishes. When the stump of the femur is less than 3 inches in length, measured from the pubis, it is of no value for leverage or end-bearing and disarticulation at the hip is preferable to amputation at this level. When disarticulation at the hip has been performed the patient can be supplied with an artificial limb which allows of a better gait than can be secured with a stump as short as 3 inches. Talbot believes that in these cases it is much better to cut through the greater trochanter than to disarticulate; that disarticulation increases the

The constrictor having been applied the patient is drawn down so that his pelvis is at the end of the table. The sound limb is abducted flexed at the knee and the foot placed on a low stool so that the leg below the knee hangs vertically downward (Fig 469). The limb to be amputated is held projecting horizontally beyond the table. This is held by the second assistant, who stands beyond the patient's foot (Fig 469). The operator always stands to the right side of the limb to be amputated. For this reason in case the left limb is to be amputated the operator stands between the two limbs (Fig 469). In order to do this easily the right limb is moderately abducted before it is flexed and the foot placed on the stool. The left limb is also held abducted (Fig 469). This is an old rule and should be followed, as it facilitates the operation.

The operator now outlines his flaps by a light touch with a scalpel. If the patient's thigh is not emaciated I use a long curved anterior flap and a short curved, almost circular posterior flap the posterior one not being more than one third the length of the anterior one. The anterior one is as long as the full anteroposterior diameter of the thigh at the site of the proposed bone section. By so doing the scar will lie well posteriorly. The flaps are



Fig 469—Diagram showing position of patient on the table and the arrangement of operator and assistants when the left thigh is to be amputated.

less. The ordinary treatment of shock was carried out with great care but the boy never recovered from his condition of shock, and no operation was undertaken—not even cleansing of the wounds. I have always felt that that boy might have had the benefit of one more attempt to save him if he had received spinal anesthesia while we were waiting for him to recover from his shock. Ordinarily the use of spinal anesthesia in thigh amputations is to be condemned, as the mortality from its use is extremely high.

As soon as the patient is anesthetized the limb to be amputated is held vertically upward for a few moments to allow it to empty as much blood as possible and then a constrictor is applied well up near the groin. There are many satisfactory methods and devices for securing constriction. My personal preference is the use of a Martin rubber bandage applied over a towel. Before applying the bandage that is to remain on as a constrictor all blood possible is expelled from the limb by applying a Martin bandage, beginning at the toes and winding the rubber bandage about the limb in an ascending spiral manner until the upper third of the thigh is reached. Here an ordinary hand towel folded once on its long axis, is smoothly wound about the thigh at its upper third, and over this the Martin bandage that is to remain on as a constrictor is applied, care being given to see that the bandage is held stretched and that it is applied over a wide zone about the thigh.

The use of this method of expressing the blood from the extremity before applying the constrictor is contraindicated in case the operation is done for a septic condition or a malignant tumor for fear of spreading the infection or disseminating the tumor cells in the blood-stream. The use of the Schrt clamp in its original or modified form has one definite advantage. After the clamp has been removed, if brisk bleeding occurs, the hemorrhage can be rapidly controlled by again applying the clamp without disturbing the asepsis. In old persons with arteriosclerotic vessels it is often best to work without applying any constrictor and control the bleeding by digital compression alone.

and, what is more important, no weight should be applied to the saw but the strokes should be very light, the saw being allowed to cut through practically by its own weight alone. I prefer the old Hefserich saw for dividing the femur and if it is used in the

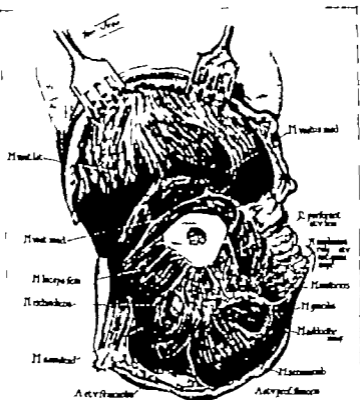


Fig. 470—Diagram (after Axhausen) of amputation stump showing topographic anatomy

manner just pointed out it will sing just as one hears the butcher's saw. While sawing the blade should be kept cool by an assistant squeezing water from a very wet gauze sponge so that the water falls slowly but almost constantly over the portion of the bone that is being cut. The assistant should take care that the leg

cut, leaving the skin attached to the muscles, and beveling the muscle-flaps to the bone. When, however, as in the first 2 cases demonstrated, the limb muscles are *greatly atrophied*, I frequently outline the flaps more angularly (Fig. 464) and later when closing merely trim off the sharp corners. In such cases I proceed as follows. Using an amputating knife not over 6 inches in length, I make a longitudinal incision on either side of the thigh and just posterior to the femur. These incisions are just as long as the anteroposterior diameter of the thigh at the proximal end of the flap. Above the scalpel is carried deep into the muscle substance whereas below the incision is progressively more and more superficial until at its lower end it reaches only to the muscle. After having made these two lateral incisions, a transverse incision is made across the front of the thigh connecting the lower ends of the two lateral incisions. This extends merely down to the muscles. Two sharp retractors are now inserted so as to make traction on the anterior flap, which is now cut by making further transverse strokes with the scalpel from the one to the other longitudinal incision. In this manner the flap is formed consisting of skin left attached to the muscle which is beveled until the bone is reached (Fig. 470). After the anterior flap has thus been cut and held retracted upward, a large gauze compress is applied and then the limb is raised vertically to facilitate cutting the posterior flap. The posterior flap is cut in exactly the same manner as the anterior flap except that it is beveled more vertically. After the two flaps have been cut and retracted, any remaining muscle bundles are divided by a circular sweep of the scalpel about the femur.

The two flaps are now held strongly retracted well proximal ward by means of a two-tailed retractor of muslin, so as to expose the periosteum for several centimeters above the proposed line of bone section and the leg is now returned to the horizontal position. The periosteum is cut circularly about the bone retracted upward and downward a short distance and the bone now sawn squarely across. It may be pointed out that in sawing any bone two small points of technic are helpful. The saw should be drawn back and forth the full length of the blade

(b) A new method of treating the nerves to prevent straying of the fibers and painful neuromas was devised during the recent war by Kruger (München med Wchnschr 1916 No 10). Kruger crushes the nerve at the proposed site of division high up by means of a crushing clamp. This clamp completely destroys the nerve-fibers, but leaves the nerve sheath intact. The nerve is divided through this crushed area, so that the ends of the divided nerve fibers are covered by the sheath. Straying of the regenerated axis-cylinders is thus prevented and painful neuromas are avoided. Payr has warmly recommended the method. While it seems a rational method and is applicable to nerves of all sizes, not enough cases have yet been reported and the after results studied to allow one to evaluate the merits of the method at the present time. Ritter has pointed out that one should be slow to employ the method in case of an infected stump as in war surgery since the crushed area must break down in part and he believes this might favor adhesions.

Very recently Huber and Lewis (Archives of Surgery Vol. I, No 1 July 1920 pp 85-113) have presented experimental evidence which shows conclusively that the inverted V operation of Ritter and the "crush and tie" operation of Kruger do not prevent neuroma formation. They find that if after the nerve is divided the trunk of the nerve is injected with absolute alcohol by means of a hypodermic syringe and fine needle introducing the alcohol from $\frac{1}{4}$ to 1 inch above the plane of section and using enough alcohol to make the nerve appear a dull white neuroma formation is thereby more successfully prevented than by any of the other methods ordinarily employed.

Irrespective of whichever method one employs in treating the nerves it is well to proceed in a systematic manner. The saphenous nerve accompanies and lies immediately in front of the femoral vessels (Fig 470). It is isolated drawn down as far as possible divided high up and allowed to retract. Next, the sciatic nerve is sought. The sciatic nerve lies just behind the biceps muscle (Fig 470) deep in the posterior portion of the stump. The muscles behind the femur are divided into two main masses, the adductor group on the medial side, and the flexor

is held firmly in line during the last few cuts of the saw so that the bone does not break from the weight of the leg. When the leg has been removed, the stump is strongly flexed at the hip, and the large vessels and nerves are sought. If one is familiar with their location and landmarks they are all readily found.

The femoral artery and vein are first looked for and clamped. These lie behind and just lateral to the sartorius muscle. The sartorius muscle can readily be located by remembering that it lies at the most mediolateral portion of the stump just behind the quadriceps group of muscles (Fig. 470). The femoral vessels may have retracted into the depths, but they can easily be found if one recalls their relation to the sartorius muscle. The artery usually lies in front of the vein. All other bleeding vessels are clamped as quickly as possible. These smaller vessels lie for the most part in the intermuscular septa. Branches of the deep femoral artery and vein, perforating branches, are sought for immediately behind the *linea aspera* and beside the sciatic nerve (Fig. 470). After all these vessels have been clamped, they are ligated in the ordinary manner. Attention is next given to the nerves.

The proper treatment of the nerves so as to prevent neuroma formation as far as possible is one of the chief factors in accomplishing an end-bearing painless stump. Although several methods have been devised to accomplish this, two methods are at present most commonly advocated and used: (1) the method of Ritter and (2) the method of Kruger.

(1) Ritter's method consists in cutting the nerve in a fish-tail manner so that the distal end of the nerve stump has an inverted V shape. When the nerve which has been so divided retracts into its sheath the two sides of the V tend to become approximated and to prevent the nerve-fibers from straying from the end of the nerve stump which becomes covered by the sheath after the nerve has retracted. The Ritter method is practicable only in case of large nerves like the sciatic. In case of the smaller nerves all that is necessary is to draw them downward as far as possible and divide them high up so that they will retract well away from the scar.

ordinarily placed transversely across the muscle so as to protrude from either end of the stump. Lastly the skin is closed with a running silk suture or with interrupted stitches.

The stump is covered with a copious dressing which is held in place by strips of adhesive plaster which extend well up on to the hip and one or two strips placed circularly about the stump. These are applied with the stump well flexed. Over this a gauze spica is applied. This passes about the pelvis and holds the stump flexed at the hip.

Postoperative Routine Care of the Amputation Stump — When the patient is returned to bed, the flexed stump is supported upon a pillow. As this position tends to favor flexion-contracture, which is the type of contracture that naturally tends to occur it is well to remove the pillow and allow the stump to remain extended for a short time once or twice a day. At this time in order to further counteract the tendency to contracture in flexion and abduction, the stump should be passively extended and adducted to the full limit. If a drain has been used it is ordinarily removed about the third day or as soon as drainage ceases. The stitches are ordinarily removed at about the seventh to the tenth day.

The measures suggested by Hirsch or slight modifications of these are a most important part of the after treatment and have long been recognized as being of great value in obtaining end-bearing stumps. Their practical value was conceded by those taking part in the discussion of amputations at the Fourth International Surgical Congress held at New York in 1914 and their value was demonstrated beyond question by the vast clinical experience during the war.

The Hirsch method of after treatment has for its aim the proper maintenance of the circulation and tone of the muscles and the hardening of the tissues at the end of the stump so as to make end-bearing painless. The treatment is begun even before the wound is healed and consists of measures employed while the patient is still confined to bed, and those employed as soon as the patient is able to be up and about.

As soon as the stitches are removed the stump should be

group on the lateral side. The biceps is the most laterally located muscle of the flexor group (Fig. 470).

In the 3 cases just presented the sciatic nerve was treated by the Ritter method. Before dividing the nerve high up the nerve stump was drawn downward as far as possible and blocked with $\frac{1}{2}$ per cent. novocain so as to prevent shock. The shock that accompanies high amputations is believed to be due chiefly to high division of the large nerves. In order to reduce this as much as possible the nerve is blocked before it is divided. This is quickly and easily accomplished by injecting it with $\frac{1}{2}$ per cent. novocain or cocaine solution, using an ordinary hypodermic syringe and a very fine needle. When the contents of the syringe are injected the nerve swells slightly. The division is made through the swollen area.

Now the large internal saphenous vein is sought and ligated, and any other visible subcutaneous veins. Also any superficial nerves encountered are shortened. Next, the periosteum is removed from the terminal 1 cm. of the stump of the femur and the marrow curetted out for the same distance. This is known as the Bunge method of aperiosteal amputation, and is a simple and effective means of preventing the development of osteophytes, which are a common cause of painful stumps. (If the periosteum and marrow are removed for too great a distance from the end of the bony stump necrosis of the terminal portion of the bone may occur.)

The Bunge aperiosteal method of treating the bone stump together with the proper treatment of the nerves to prevent neuroma formation, and the Hirsch method of after-treatment have proved of great value in accomplishing painless and good end-bearing stumps.

The sharp edges of the bone may with advantage be smoothed off by the use of a bone-cutting forceps. This applies particularly to the linea aspera.

Finally the two flaps of muscle are sewed together with interrupted chromic catgut stitches beginning so as to first cover the end of the bony stump and progressing in layers till the skin is closed. Before closing the skin a rubber drainage-tube is

The following method of constructing a temporary artificial leg which is a modification of the one suggested by A. Ritschl published in 1915¹ and the one published from the office of the Surgeon-General, U. S. Army in *The Military Surgeon*, vol. xlii, No. 4 April, 1918 can be carried out with ease and without any special equipment.

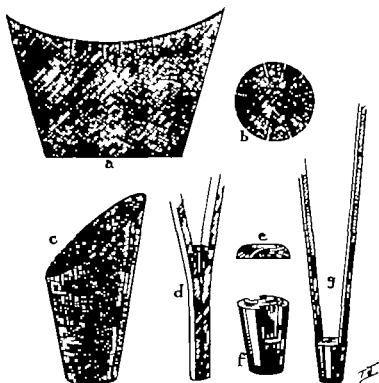


Fig. 471.—Diagram, slightly modified, from *The Military Surgeon*, April, 1918.

Method of Constructing Temporary Artificial Limb—Two pieces of white pine, each 36 inches long $1\frac{1}{2}$ inches wide, and $\frac{1}{2}$ inch thick are rounded on two edges (Fig. 471 *e*). A truncated cone of white pine 4 inches long $2\frac{1}{2}$ inches wide above and 2

Amputationen und Extremitäten der unteren Gliedmaßen, A. Ritschl, Ferdinand Enke 1915

massaged for ten to thirty minutes once or twice daily. At first this massage is very light. It is increased in depth and force as rapidly as the tolerance of the stump will permit. In order to harden the skin at the end of the stump the patient is given pressure exercises. The patient presses the end of the bandaged stump against some rigid obstruction, such as a box placed in the bed or against the mattress. At first this pressure is made for a few minutes only several times a day. If this is well borne, the pressure exercises are increased to five or ten minutes every two hours, and later every hour. After each pressure exercise the patient actively moves the stump in all directions as far as he is able to giving particular attention to full extension and full adduction. Later when the strength of the muscles has increased, resistance exercises are begun in order to prepare for the early use of a temporary artificial limb. The circulation of the stump is promoted by the use of warm baths or electric-light baths, or by the use of the contrast bath. This consists of alternately plunging the stump into a pail of very cold water and then into a pail of very hot water as rapidly as the patient can do so. This is kept up for five or ten minutes at a time once or twice daily.

As soon as the patient is able to be out of bed the end of the stump is further hardened by beginning end-bearing at once. This is accomplished by having the patient stand beside the bed on his sound leg supporting himself with his hands on the mattress, resting the end of the stump gently upon a pillow placed on a stool of suitable height. As soon as sufficient progress has been made to do so the patient supports himself entirely by standing with one foot on the floor and the stump resting on the stool. The thickness of the pillow placed on the stool is gradually decreased. A little later the patient gently pounds the end of the stump against the stool in order to prepare the stump for the use of a temporary artificial leg which is applied as soon as the patient is able to make these pressure exercises against the stool with a moderate degree of force.

The patient walks with his temporary artificial limb as early as possible.

473) The upper 2 inches of the felt is turned down over the bandage to form a cuff

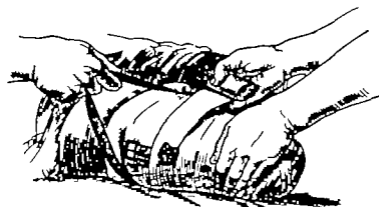


Fig 473.—Diagram, slightly modified, from *The Military Surgeon*, April, 1918.

While the patient holds the felt in this manner a plaster-of-Paris bandage 5 inches wide is applied around the stump for its entire length, being careful not to include the felt cuff (Fig 473)

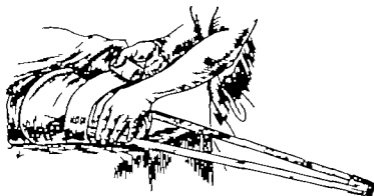


Fig 474 — Diagram, slightly modified, from *The Military Surgeon*, April, 1918.

Meanwhile an assistant prepares a molded plaster splint 5 inches wide and as long as half the circumference of the upper end of the stump. This is now applied to the medial side of the

inches wide below is used for a foot-piece (Fig 471 *f*). Two grooves are cut into opposite sides of this so that 2 inches of the side-bars may be fitted flush and screwed into this foot-piece (Fig 471 *g*) which is completed by a disk of rubber attached to the bottom. The side-bars are cut so that when attached the total length of the artificial limb will equal that of the other leg with the shoe on. The lateral side-bar is 2 or 3 inches longer than the medial side-bar. A few carpet tacks are driven into the outer surface of the upper end of each side bar allowing the heads of the tacks to project $\frac{1}{2}$ to $\frac{3}{4}$ inch. A piece of saddler's felt



Fig 472 —Diagram showing method of covering stump with felt.

$\frac{1}{2}$ inch thick is cut to fit the stump (Fig 471 *a*) according to the following measurements: circumference of the thigh; the perineum; oblique circumference from perineum downward over the great trochanter; circumference at lower end of stump; length from perineum to end of stump; length from great trochanter to end of stump, allowing 2 inches additional above to be turned over as a cuff. The upper edge of the felt is notched (Fig 471 *a*). The felt is carefully fitted to the stump and sewed (Fig 472). During the sewing the felt is held well up against the tuberosity of the ischium by means of a bandage held by the patient (Fig

of the ischium, as this is the point that supports most of the weight. In front it should sink in a gentle curve about 1 inch below the horizontal ramus of the pubis, as the available surface of the horizontal ramus of the pubis is unsuited to bear weight because it is narrow and ridge-like and the skin over it is particularly delicate.

A short piece of webbing $1\frac{1}{2}$ inches wide with a buckle attached to one end is placed on the lateral side of the artificial limb (Fig. 473) and a similar short piece of webbing with a pulley attached is placed on the medial side. These are fixed in place by four or five turns of the plaster bandage (Fig. 473). Then the lower free end of each strap is doubled back and covered in with further turns of the plaster bandage. These two straps are so placed that they are entirely covered except the buckle on the one and the pulley on the other (Fig. 474). These straps are later fastened to the device suggested by Fiedel (Fig. 475). This method of supporting the medial side of the artificial limb is of particular advantage because it allows complete flexion and extension and at the same time holds the leg firmly in place.

The side-bars are now fastened on by two or three plaster bandages (Fig. 474) and the end of the stump covered in sufficiently to bear the patient's weight. After the plaster has set the temporary artificial limb is removed, the upper margin trimmed, and the felt cuff turned down. It is put in a warm place, where it is left until it is dry and hard. The felt cuff is now glued down and the artificial limb is ready to wear.

The patient walks with this temporary artificial limb as early as possible, and its use is continued for three or four months. It is not until the end of this time that the patient should be fitted with a permanent artificial leg.

upper end of the stump and is held up against the ischium by means of the same bandage held by the patient to support the felt, and in the same manner. The upper 1 inch of this molded

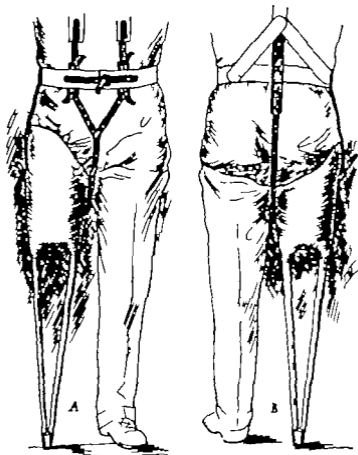


Fig. 473.—Diagram, slightly modified, from A. Rasch, 1913, and *The Military Surgeon*, April, 1918.

plaster-of-Paris splint is turned down over the bandage as cuff and this reinforcement is molded to fit accurately special care being taken that it is carefully molded about the tuberosity

CLINIC OF DR. EDWARD LYMAN CORNELL

CHICAGO LYING-IN HOSPITAL

TRANSPERITONEAL CESAREAN SECTION

Summary Recurrent attacks of vaginal bleeding six weeks before term in patient whose pregnancy up to that time had been apparently normal. Delivery by transperitoneal cesarean section the safest method of procedure in this particular case. After-history.

PATIENT No. 13 777 referred by Dr. Sidney Klein, age twenty-eight years, para I entered the Chicago Lying-in Hospital September 13, 1920. She gives the following history:

The menses began at twelve and a half years, were regular, four to five days in duration, without pain. The last menstrual period was December 29, 1919. The patient had been feeling well up to six weeks ago, at which time she had vaginal bleeding. She was kept in bed and the bleeding stopped in about a week. From that time until September 11th she has been comfortable. On September 11th the bleeding recurred. It was not profuse, just a staining. On the 12th it became more pronounced, and on the 13th she entered the hospital.

Previous History—Menstrua in childhood; appendectomy in 1910; tonsillectomy in March, 1919.

General examination including heart and lungs was negative. The urine throughout the pregnancy has been normal. The blood-pressure has never been over 120 systolic. The pelvic measurements are:

I Sp. 27 I Cr. 26 Bi tr. 30 Baud. 19 Tub. 8½ C D.
13 C V. 11

The pelvic inclination is somewhat exaggerated and the edges of the membranes near the placental site are palpable. The placenta is on the posterior wall of the uterus. The baby's

test of labor for thirty nine hours, who has had morphin and scopolamin once, whose temperature is gradually increasing as is the pulse the bag of waters has ruptured and the liquor amnii has drained out she has a generally contracted flat pelvis, and as you can see, she is a short rather fat woman. If you will look at her arm you will notice that all the bones are short. She has had one vaginal examination in the hospital and eight or nine rectal examinations. She has a low insertion of the placenta. The head is not engaged the baby is not large the cervix is not dilated. Can delivery be accomplished from below if we attempt to use forceps? We cannot attempt to do a forceps delivery unless we should decide first to do a vaginal cesarean section. Then it would mean that we would have a case of forceps on a floating head through an unprepared vagina and through a contracted inlet. Our chances for delivering a live baby without considerable damage to the baby would be slim to say the least. If the head was pulled through this canal we would probably get a skull fracture or at least a brain hemorrhage with its resulting complications. From the fact that her pulse has increased and her temperature has risen slightly we suspect that infection is beginning and with all the traumatism that would follow vaginal delivery the chances for puerperal sepsis are good.

The next method of delivery to be thought of is podalic version, bringing a foot down and allowing the breech to dilate the cervix. This is not advisable in this case because first, we have no liquor amnii and the uterus is grasping the fetus rather firmly and the lower uterine segment has been thinned out to the point where Bandl's ring is quite pronounced. It is possible occasionally to turn these babies without getting a ruptured uterus, but unless done by an expert it is very dangerous. Even if we could turn the baby we would still have a contracted inlet through which to deliver the head. The fact that the parietal bones are overlapping markedly indicates that the inlet is more contracted than our measurements would lead us to believe.

The method still remaining of delivery from below consists in craniotomy. No one these days wants to do a craniotomy on a living child.

weight is estimated at 7 pounds. The diagnosis of position was occiput left transverse

The patient's stay in the hospital until October 2d has been uneventful except for the fact that there has been more or less bleeding. Recently rather large clots have been noticed. On October 2d at 4.30 A. M. the patient complained of having pains at ten minute intervals. The pains gradually increased in severity during the day and at 8.40 P. M. the bag of waters ruptured spontaneously. The patient complained of being tired, and morphin. gr $\frac{1}{4}$ with scopolamin, gr $\frac{1}{16}$ were given. The effects of this lasted until 2 A. M. October 3d. The pains then became stronger. With the rupture of the bag of waters the head descended somewhat and the bleeding was lessened. The pains gradually increased in intensity and frequency and yet there was very little effect upon dilatation and descent of the head. The patient's temperature rose from 98° to 98.8° F and pulse from 90 to 118. Previous to this time throughout her stay in the hospital her temperature has been normal, but her pulse has been somewhat rapid, ranging between 90 and 100.

October 3d at 9.30 A. M. a rectal examination showed the cervix to be rather thick with $5\frac{1}{2}$ cm dilatation. The head was not engaged and the parietal bones overlapped. The fetal heart tones were 156. At 4 P. M. there was 6 cm. dilatation. The cervix was still thick. The head was not engaged and the fetal heart tones were 160.

At 7.30 P. M. I was asked to see the patient. At this time I found that the cervix was thick (edema) with 4 cm. dilatation. The head was not down to the spine. The posterior parietal bone presented, with much overlapping. The head was in the transverse diameter and could be easily moved out of the pelvis. Grasping the head through the abdomen, it could not be pushed down into the pelvis. The promontory was easily felt per rectum. The pains have practically ceased in spite of the use of quinin. Bandl ring is quite pronounced. The patient's temperature is 98.6° F pulse 118 respirations 28. She is very restless and beginning to show signs of exhaustion.

To sum up. We have here a patient who has been given the

heed in the usual manner. The parietal bones are overlapping approximately $\frac{1}{2}$ cm. The child is in good condition, so there is no need to hurry the delivery of the shoulders and body. One must remember that in delivering the shoulders considerable damage can be done to the lower uterine segment by rough handling. The cord is cut between clamps and the baby is passed to the assistant. You will notice that the cry is vigorous. We caution the assistant to pay particular attention to the eyes in this case. He will use several drops of 1 per cent. silver nitrate, allowing it to remain in the eye. The baby's cord will also be carefully disinfected with 1 : 5000 bichlorid of mercury. There is no need to hurry the delivery of the placenta. The patient is given 1 c.c. of pituitrin and 1 c.c. of ergot. It is now three minutes since the baby was born and the uterus is contracting well. If you look through the uterine incision you will see that the placenta has become loosened and is bulging into the wound. It is located on the posterior wall of the uterus well down in the lower uterine segment. Gentle pressure over the fundus through the abdominal wall (not inside the abdomen) causes the placenta with the membranes to be extruded from the uterine incision. We now grasp the placenta and gently extract it. We find that the lowermost edge of the placenta contains an old clot which is partly organized. It is, therefore, probable that the profuse hemorrhage earlier in pregnancy was due to placenta praevia marginalis.

The operators will now sterilize their gloves by using concentrated lysol solution followed by sterile water and 1 per cent. lysol solution. The uterine incision will be closed in the usual manner.

Dr. Falls reports that there is a Gram-positive diplococcus in the smear. There are no chains, but there are leukocytes.

The question now arises, Shall we use a drain or shall we close the wound tightly? We know that the peritoneum in the pelvic region is capable of handling severe infection many times without causing the death of the patient from peritonitis. We have this patient in the hospital under constant observation, and I feel that under the circumstances it would be best to close this

Two other methods of delivery present themselves—one, the classical cesarean section, and the other the transperitoneal cesarean section. The classical cesarean section is out of the question in this case because of the fact that the bag of waters has been ruptured so long and because the temperature and pulse have increased. The risk to the mother is too great. Transperitoneal cesarean section can be done with the least amount of risk to the mother and practically no risk to the child. We have therefore, a patient whose chances for delivery from below with a live child are very precarious. The only method available is a vaginal cesarean section and high forceps, with all the trauma that usually goes with these cases. The mother's chances of infection and chronic invalidism are greater than in delivery from above. We will deliver this patient by a transperitoneal cesarean section.

The patient is prepared according to the method described in a previous clinic. An incision is made in the median line from the pubes upward about 12 cm. We go through the fat, fascia, and peritoneum. Care must be taken that the bladder is not injured in cutting the peritoneum, as one must remember the bladder is drawn up out of the pelvis during pregnancy. The peritoneum over the uterus is cut transversely 1 cm. above the junction of the bladder and the lower uterine segment. The bladder is then peeled from the lower uterine segment. The peritoneum on the uterus is stripped up as far as possible at least to the junction of the lower uterine segment with the body of the uterus. We then incise the cervix in a longitudinal direction. This incision is approximately 10 cm. long and we find that there is a mucopurulent discharge exuding. Considerable care is exercised in mopping this material without contaminating the skin wound and the peritoneal cavity. It is possible to keep this material confined in this case because the liquor amnii has been drained. We will take a sample of this exudate in small syringe and give it to Dr. Falls, who will stain and culture it. The baby's head is delivered with forceps. You will notice that the cord is around the neck three times. It is lifted over the

CLINIC OF DR. RALPH BOERNE BETTMAN

MICHAEL REESE HOSPITAL

THE REMOVAL OF EMBEDDED NEEDLES IN BROAD DAYLIGHT WITH INTERMITTENT FLUOROSCOPIC CONTROL

Summary Difficulty of removing needles embedded in hand or foot. Removal greatly facilitated by use of head fluoroscope with intermittent screen control

ALL surgeons know from sad experience that the removal of a needle embedded in hand or foot, although apparently a simple procedure, is, in reality a most difficult one.

The stereoscopic x ray pictures, the screen localization, seem to determine the position of the foreign body to an exactitude, and yet the small incision made over the location of the needle often fails to reveal it. A larger incision is made and still no needle discovered. The x ray plates are again consulted, the wound further enlarged the margins sectioned and finally just as the surgeon is about to despair the needle is discovered embedded in tissue hidden under the retractor or on the other side of a fascial plane or just to this or that side of the wound. The frequency of such occurrences has made me wonder why fluoroscopic control is not more often employed.

In 1916 while working with Dr J Rilus Eastman in a base hospital, numerous cases with retained shell fragments were admitted to the wards. We found that the difficulties experienced in removing embedded needles in civil practice were being repeated here with these small metal bodies. Although the fluoroscopic localization methods and the roentgenograms placed our object to within a millimeter or two the removal thereof was, as a rule a long and tedious process. The first incision

abdomen tightly. We will, therefore, follow that procedure. After the uterus is closed we find that the promontory is very easily felt and is overriding the inlet. This undoubtedly accounts for the dystocia. It is felt through the uterus. The hand must never be passed behind the uterus in cases of suspected infection.

The mother and baby left the operating room in excellent condition. The baby weighs 2805 gr and is 48 cm. long. The measurements are

Biparietal 8 Bitemporal, 9 Subocc. hreg 10 Occip. front
11 Occip. ment. 13½ Basal 11 Bistiliac. 8

After-history—The cultures made by Dr. Falk from the solution removed at operation showed staphylococci. No growth was found at the end of twenty-four hours, and it was only at the end of forty-eight hours that the broth showed signs of growth.

After operation the patient's pulse was 122 and temperature 99° F. The second day the temperature rose to 101.7° F. and then gradually came down until the seventh day when it reached normal, and remained there during the rest of her stay in the hospital. The pulse gradually came down, being below 90 from the fifth day on. Several times during her stay in the hospital of fifteen days she had attacks of severe pain in the gall-bladder area. The stitches were removed on the ninth day. The wound was in very good condition with the exception of one stitch which showed a small area of infection. This infection did not extend beneath the skin.

This case demonstrates one of the possibilities of the trans-peritoneal cesarean section.

The operating fluoroscope consists of a small fluoroscope similar to the hand fluoroscope in common use. It fits snugly against the operator's forehead and cheeks, so that when the screen is down it is light-tight. It must weigh as little as possible. The straps over the head are adjustable. The screen is on a hinge and is held closed by a spring. When the screen is open the same spring holds it open. At the same time a bit of

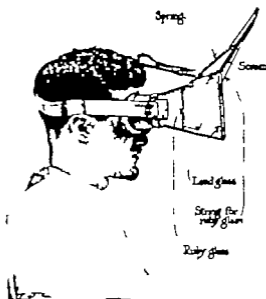


Fig. 476—Operating fluoroscope with screen open. The surgeon is looking through this piece of ruby red celloid which has been pulled in front of aperture by raising the screen.

ruby glass is raised before the operator's eyes. This ruby glass is to preserve the pupillary accommodation. A young man or one with a very adaptable power of accommodation to light can dispense with red glass.

Lead glass, the same as used for the fluoroscopic screens in common use, is placed at the base of the hood, so as to protect the operator. The screen is the usual fluoroscopic one.

altered the relative position of the skin marking it was difficult to place the part of the body operated upon in the exact position adopted during the localization, the slight oozing veiled the object, etc. We finally were forced to adopt the common technic of general anesthesia—large incisions and long protracted search. It occurred to us that the removal of these foreign bodies in the x ray room under the fluoroscope would simplify matters, but we soon found that it was no easy task to control the anesthesia maintain asepsis, and preserve structures of anatomic importance in a dark room or in a room alternately darkened and lighted. An ideal method seemed to be a combination of the two and so the monocular fluoroscope of Grashey was put to the test. A surgeon using Grashey's monode loses half his sight, nine-tenths of his stereognostic sense and gains but little *fluoroscopic information*. After many trials I finally constructed an operating fluoroscope similar to the one illustrated. With this fluoroscope operating in broad daylight and having at hand the means of obtaining fluoroscopic aid without danger to asepsis, without changing the patient or room we found that we could remove embedded shell fragments through small incisions with a speed and precision which soon established the value of this method.

The French surgeons working with the bonnet fluoroscope of Desane had the same experience and the method of intermittent screen control in removing shell fragments was widely adopted. Any A. E. F. men who had the good fortune to see their work will testify to the ease with which even small, firmly encapsulated fragments were removed. Holzknecht in Austria, constructed a very elaborate device for x-ray control in removal of foreign bodies in daylight. In his method the surgeon does not have the fluoroscopic vision.

It is surprising that despite the fact that the advantages of intermittent screen control in the removal of foreign bodies were so definitely proved during the war wider application of this procedure should not have followed in civil surgery. To urge the adoption of this method in civil practice I do not hesitate to repeat what already has been told.

are being removed it might be advisable to raise the height of the table to that of the average operating table.

The French bonnet is very similar to the instrument described. In the Desane fluoroscope the entire lower part of the bonnet is raised instead of the screen only.

A very practical operating fluoroscope can easily be constructed out of the ordinary hand fluoroscope. The bottom (the screen) is detached and then reset on hinges, and springs are attached to the screen and the box, so that the screen will be held open or closed. Straps are attached which will fit the surgeon's head.

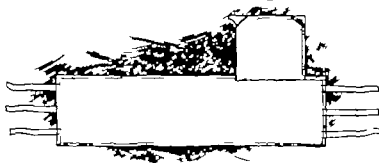


Fig. 478.—Sterile shield used to cover operating fluoroscope during the operation.

The first patient upon whom I am going to operate today has a broken needle in the palm of her right hand between the heads of the second and third metacarpals. Six days ago while cleaning a table in a millinery establishment she ran the blunt end of a needle into her hand the point projecting. She drew the needle out, noticed that the eye was missing but concluded that the needle had probably been a broken one.

The hand continued to hurt, and now six days later she has come to us. The hand is not swollen or reddened. The motion of the fingers is normal, but extreme flexion and extension cause a sharp pain deep in the palm. The fluoroscope reveals the end of a needle lying obliquely in the interspace between the second and third metacarpals and ventral to the

When the screen is opened the surgeon has direct vision. When the screen is closed no matter how brightly lighted the room be, the surgeon can see the fluoroscopic images exactly as if he were in a dark room using an ordinary fluoroscopic screen.

In order that the surgeon may himself regulate the position of the tube and the size of the aperture of the diaphragm with-



Fig. 477 —Operating fluoroscope with screen closed. The surgeon is looking at the fluorescent screen.

out breaking sterile technic or having to use his hands wooden horseshoe-like brackets which can be manipulated by the knees, are fastened to the handles of the tube box controls.

The usual fluoroscopic table with the under table sliding tube box, installed in every x ray department, is amply sufficient. In industrial plants or wherever a large number of foreign bodies

shadow I have no trouble in distinguishing the fluoroscopic images.



Fig. 480.—Fluoroscope view in removing needle with intermittent screen control. The probe is in the depth of the wound. The surgeon notes the relative position of the needle.



Fig. 481.—The needle has been grasped with hemostat and is being extracted.

A cuff of a blood pressure apparatus has been put about the arm to act as a constrictor. I close the screen step on the pedal which controls the current to the tube. I now see the

bones. By carefully observing the needle as I rotate the hand I see that the radial end of the broken needle is nearest the skin.

The fluoroscopic table is our operating table. My assistant and myself are scrubbed as if in the operating room and the field of operation is prepared with the usual care and draped

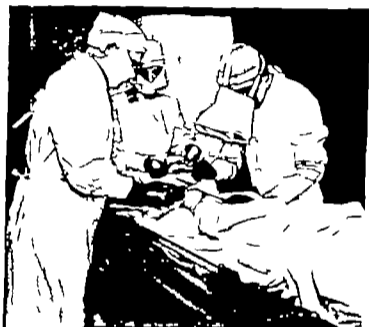


Fig. 479—Showing the method of operating with the aid of the operating fluoroscope. The incision has been made and the surgeon is observing the position of the needle in relation to the tip of the probe which he has placed in the depth of the wound.

with sterile linen in the usual manner. I am wearing the fluoroscope which the nurse has covered with a sterile cloth. As you see I have taken out the ruby glass. My eyes accommodate very quickly to light, or I might better say dark and in this particular case where the part upon which I am operating is comparatively thin and where the foreign body casts a marked

With this additional information I proceed to dissect through the fascia extending the incision slightly toward the fingers. The patient is complaining of the pressure of the tourniquet, so while the cuff is deflated I will make another screen observation. This time I see that the probe shadow is over the shadow of one end of the needle and turning the hand sideways I can see that I am almost touching it.

The cuff is now infiltrated gently very gently swab out the wound, cut down at the upper angle, and here you see is my



Fig. 483.—The retractors have been replaced and the surgeon is now cutting down directly upon the needle. *Note.* In Figs. 480-483 the diaphragm is set so that the rays fall entirely within the area of the screen—the area of lead glass protection.

needle. I will grasp it and withdraw it. In order to make sure that this time the entire embedded body is being removed I close the screen again, turn on the current, and observe that no foreign body remains.

Had I been operating in a field of less anatomic complexity than the hand—say the buttocks—I would have made my skin incision as I have done here and then by blunt dissection would have worked down toward the foreign body. When near it I would have closed the screen and with a long curved forceps have dissected directly to my object under the fluoroscopic con-

fluoroscopic image of that part of the hand exposed and can readily distinguish the needle. I will place the point of the scalpel over the most accessible end of the needle. I shut off the current, raise the screen, and mark the point where my knife is resting knowing positively that the end of the needle lies below it.

After infiltrating with $\frac{1}{2}$ per cent. novocain solution I am ready to make my incision, which will be a small one over the upper end of the needle. I can make my incision and do



Fig 482.—The surgeon has made a large wound and still is unable to find the needle. The needle is lying in the wound margin and is being pulled out of its former position by the retractor. This is a frequent occurrence and without the aid of the fluoroscope could be very perplexing.

my dissecting with due regard to the preservation of the tissue instead of cutting down perpendicularly to the axis of the needle, regardless of the anatomy with sole intent of finding the foreign body. I am down to the palmar fascia but before I proceed will reorientate myself. I put the probe in the depth of the wound, close the screen, turn on the current. I can see my probe is proximal to the needle that is, toward the wrist. When I turn the hand sideways I note that the end of the needle is still a little deeper than the probe.

I now turn the foot back again and resume the search. I know that my needle lies a little dorsal and a trifle distal of my incision, so that I will extend the wound slightly toward the toes and cut away from the sole of the foot. I am sure I am deep enough now and think I am far enough toward the toes. I will try another orientation first, with a lateral view and second in the anteroposterior plane.

ASSISTANT: "The blade of the scalpel is very slightly plantar to the needle. In the anteroposterior plane the shadow of the outer end of the needle merges with the shadow of the scalpel. Kindly withdraw the scalpel a little. Now the shadow of the outer end of the needle is separated from the scalpel. Please put the scalpel down to the depth of the wound the way you had it before. The shadow of the scalpel overlaps that of the needle by about one-half the width of the blade of the scalpel."

The needle lies in the upper margin of my wound. I have returned the foot to the lateral position and will cut into the dorsal wound margin. Here is the needle just above where I was before. To make sure that I have extracted the entire needle we will make a fluoroscopic control.

ASSISTANT: "No foreign body to be seen."

I will insert a small gutta-percha drain, leave the wound open and apply hot, wet dressings.

A word as regards the dangers. For some reason or other it seems the roentgenologists in our army who having been just recently instructed in the danger of burns did most to terrify the surgeon. This dread is unfounded. In the first place an aluminum filter is used to protect the patient just as in the usual fluoroscopic examination. In the second place by using the fluoroscope intermittently as a control the total length of exposure is usually you see very much less—one-half or one-third the length of single routine gastro-intestinal examination. As regards the danger to the surgeon and assistants this is also nil as long as ordinary precautions are used. The surgeon who inserts and removes an occasional foreign body is infinitely less exposed than the ordinary radiographer. The lead glass protects against the use of the screen. The diaphragm must

trol. In such a case where I could not have rotated the part, I would have gained the information regarding the depth of the object by sliding my tube up and down and noted the relative duration of the shadows of the probe and object. The shadow of the object nearer the tube naturally moves further than the shadow of the object nearer the screen.

The second case is a man who day before yesterday while walking barefoot about the room stepped on a needle. The needle broke off leaving a portion embedded in the foot. The fluoroscope shows the fragment embedded in the sole of the right foot lying at an angle of 45 degrees to the axis of the fifth metatarsal and just proximal to the phalangeal head. When the foot is turned sidewise the needle can be seen lying in a plane parallel to the margin of the foot and just plantar to the metatarsal bone. The outer margin of this part of the foot is slightly reddened, swollen, and tender. There appears to be an inflammatory reaction.

I am going to make my incision through this tissue so that I can leave it open for drainage. Place the patient on his left side, cover him with a sterile sheet, prepare the field of operation, and clean ourselves as if we were in the operating room. This time I am going to let my assistant wear the fluoroscope. He has now closed the screen, has turned on the current designating the position of the needle with a probe.

I now inject the novocain, blocking first above the region. I have made a larger incision than necessary for the simple extraction of a needle, dissected down approximately to the place where the needle should be and now I am going to ask for fluoroscopic guidance.

I leave the knife in the wound and my assistant will give me the direction of the needle relative to the position of the knife.

ASSISTANT With the foot in this position the blade of the knife is very slightly below the needle (plantarward).

I am now turning the foot so that the fluoroscopic screen shows the foot in the plantar-dorsum plane.

ASSISTANT The point of the knife is proximal that is heelward to the outer end of the needle.

CLINIC OF DRS GATEWOOD AND L. C. GATEWOOD

PRESBYTERIAN HOSPITAL

SYPHILIS OF THE STOMACH

Summary Patient giving history of stomach trouble of several years' duration. Report of physical examination and laboratory findings by Dr. L. C. Gatewood. **Diagnosis** Syphilis of the stomach. **Operation** Posterior gastro-enterostomy performed by Dr. Gatewood. **Discussion** on syphilis of the stomach.

THE patient I wish to present to you this morning is a married man, thirty five years of age, who was admitted a few days ago to the service of Dr. L. C. Gatewood, who will give you the history.

DR. L. C. GATEWOOD This patient gives a history of "stomach trouble" which began seven or eight years ago with attacks of vomiting. These occurred while eating or immediately after eating. At first intervals of three or four months passed between his attacks, but they have gradually become more frequent, until recently he has been vomiting after three or four meals each week. He never vomits, however, after more than two meals in any one day and usually but once a day. Vomiting always occurs within a few minutes after eating or at times before he has finished his meal.

While he dates the onset of his trouble back a number of years it has only been during the past seven or eight months that it has been acute enough to partially incapacitate him. There is little or no nausea, and he states that "if food would stay down ten minutes it does not come up." He has never vomited food which remained in his stomach longer than six hours and never a quantity larger than that eaten at the preceding meal. The quantity of food intake and the quantity of vomiting have always been small as he has not been able to

always be so adjusted that the cone of light falls entirely within the screen. The surgeon's hands need never be exposed.

While the x-ray is being used, only a long probe need be held in the wound. When the surgeon is endeavoring to reach the object by blunt dissection, a curved forceps can be used.

In summary The apparatus consists of a light fluoroscope which can be fitted to the head of the surgeon or his assistant. When the fluoroscope is open the operator has direct vision. When the fluoroscope is closed he is looking into a light-tight box and is enabled to control the position of the needle by means of the fluoroscopic vision.

The x-ray room provided there is good light, is a suitable operating room, and the usual fluoroscopic table, found in any hospital, an operating table

The object is removed in bright light, thus the anatomy of the part can be preserved, asepsis maintained, the patient kept constantly under observation, and no time lost.

Local anesthesia usually suffices.

The incision is small and is made with deference to the anatomy of the part. The tissue is not mutilated by a large scar

There is no danger of x-ray burns or irritation, either to the patient or the surgeon

The technic is simple.

This article is a plea for a wider use of the method of intermittent screen control in removing embedded needles pins, or other foreign bodies encountered in civil surgery

showed no free hydrochloric acid total acidity 12 milk-curdling ferments absent, blood and pus absent. These findings I confirmed by repeated examinations. Motor meals were vomited before the expiration of the normal emptying time of the stomach. The stools contained no blood pus, or mucus.

On fluoroscopic examination the heart and lungs were negative. The barium mixture passed through the esophagus normally without evidence of obstruction or spasm. The patient was able to take only a small amount of the barium mixture and began to complain of a full feeling. On attempting to swallow more vomiting occurred. At no time could he retain more than 6 ounces of barium without vomiting. This quantity was sufficient to fill the stomach as completely as does 1½ pints in the average case.

The stomach was quite narrow (Fig 484). There was no filling defect and the walls seemed pliable. The duodenum filled quickly and was abnormally wide. Contrary to the usual findings, the barium suspension was retained a long time in the first and second portions of the duodenum and increased peristalsis and antiperistalsis were observed. I was able to confirm these findings by subsequent examinations.

To sum up our findings. We have first, a history of attacks of vomiting second loss of weight which has been rapid in recent weeks third a palpable spleen fourth achylia gastrica fifth positive Wassermann reaction sixth, an abnormally small stomach without filling defect or other demonstrable deformity seventh evidence of duodenal obstruction. What pathology will best explain these findings.

The positive Wassermann reaction may be accepted as evidence of lues in spite of the negative history. Is this causal or incidental. In the absence of any other demonstrable cause for splenic enlargement the palpable spleen may well be due to syphilis. Vomiting occurring while eating or immediately after eating practically without nausea suggests the so-called nervous or hysterical vomiting or an obstructive process located relatively high up. Such history is not uncommon in hour-glass deformity of the stomach with a small proximal pouch. It fits

eat "regular size meals" for several months. As soon as he takes a small amount in the stomach he begins to feel full and must stop eating or vomiting will ensue. He has never noticed blood or coffee-ground material in the vomitus. While there is no history of acute pain he complains of a dull burning pain located in the epigastrium which has been present for the past seven months, recurring regularly either while eating or immediately after his meals. This burning sensation is relieved immediately by vomiting and otherwise gradually disappears within thirty or forty minutes.

The discomfort is not associated with a desire for a bowel movement, nor is it relieved by defecation. His bowels move daily without cathartics and the stools are usually formed.

He has lost 20 pounds in weight most of which he thinks has occurred within the past few weeks. His present weight is 118 pounds.

His past history is negative except for an attack of acute appendicitis three years ago, at which time appendectomy was done. He denies venereal disease both by name and by symptoms. He has been married for thirteen years and has 4 children all in good health ages twelve, ten, eight, and six. His wife has had no miscarriages.

Physical examination reveals, as you see, quite an emaciated individual about thirty-five years of age. His pupils are equal and react to light and accommodation. There is no edema of the extremities and no general adenopathy. Patellar reflexes are active and the Babinski is absent. The liver margin is just palpable below the costal border and the spleen is readily palpable. There are no abnormal masses to be felt in the abdomen and no areas of localized tenderness or muscular rigidity found.

Upon dilating the stomach with sodium bicarbonate and tartaric acid the lower border of the stomach is found just below the umbilicus and there are no visible peristaltic waves.

Laboratory reports are as follows:

Urine is negative hemoglobin (Dare) 75 per cent erythrocytes 440000 leukocytes 7500 Wassermann 4+ Blood pressure is 106 systolic and 70 diastolic. The Ewald test meal

carcinomatous or luetic in origin. When due to malignancy it does not at all necessarily show a filling defect nor any other fluoroscopic abnormality than those described. Either syphilis or carcinoma would probably show achylia gastrica. The age of the patient—thirty-five—speaks somewhat against carcinoma, but by no means excludes it. The duration of symptoms—seven or eight years—is of more value if we can be sure that the entire picture is produced by the same disease process. The only symptom prior to the past eight months, however was vomiting—a symptom which may be produced by a variety of conditions—and it would be difficult to be sure that the clinical picture (and the underlying disease process) had not undergone a change within the past year. If we accept the total duration of symptoms as speaking against malignancy have we sufficient evidence to justify a diagnosis of gastric syphilis?

The subject has recently been discussed rather widely by such men as Eusterman, McNeil, Wile Carman, and Chase. Chase has summarized the requirements of gastric syphilis as follows

- 1 Positive Wassermann reaction
- 2 Evidence of syphilis elsewhere than in the stomach.
- 3 Demonstration of a stomach lesion.
- 4 Improvement under antisyphilitic treatment.

In the present case a positive Wassermann has been found, and the enlarged spleen may be accepted as probably filling the second requirement. While the form of the stomach may be a congenital anomaly this is improbable owing to the duration of his symptoms. Antiluetic treatment has not been given, so that the fourth condition has not been fulfilled. In addition, we have found fluoroscopic evidence of a duodenal obstruction, probably in the retroperitoneal portion. Inasmuch as we have repeatedly seen a large duodenal loop which showed increased peristalsis and antiperistalsis and did not empty at any time in the normal way this finding is not readily explained as a part of any stomach lesion. I have seen it in patients with very large carcinoma of the stomach involving everything adjacent to it. Such an affair however does not show the stomach freely mov-

well with our finding of a small stomach, particularly with the history of being able to eat only a small quantity. The loss in weight might be due either to the vomiting and limited food

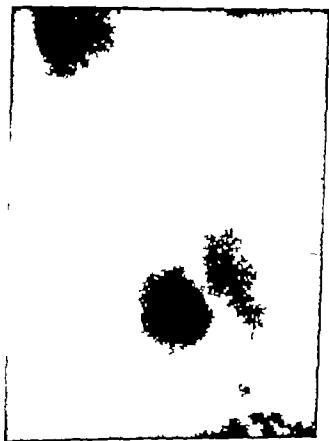


Fig. 484.—This picture is reversed, owing to the γ in back as taken. Note the full duodenum and the narrow, irregular stomach all

intake or to constitutional disturbance from organic disease. The size and form of the stomach suggest at once *hyperplastic*

treatment and it is a question whether the operation should not be entirely exploratory. However this patient has been losing weight very rapidly, he is very markedly emaciated and

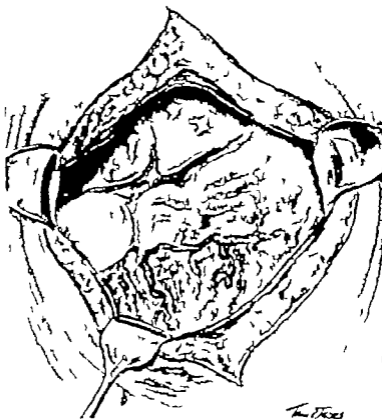


Fig. 485.—Condition found on opening the abdomen. There are no adhesions to the anterior abdominal wall. The stomach lies almost entirely above the costal margin. It is very small, the walls are markedly thickened and there is suggestion of hour-glass formation in the fundus. The duodenum is larger than the pyloric end of the stomach and the pylorus is thickened.

the medical men have not been able to feed him sufficiently to obtain a gain in weight. As there is very definite evidence of obstruction in the duodenum an anastomosis between the

able, with pliable walls, but rather one which is inelastic and fixed to the posterior abdominal wall. This obstruction may be explained by syphilitic involvement of the duodenum or pancreas or adjacent lymphatic structures. A primary lesion in the pancreas carcinoma for example might explain the duodenal obstruction, but would not account for the stomach findings. We would be forced to advance two or more diagnoses to account for all the conditions present. Under the circumstances I believe the findings are best explained on the basis of syphilis involving the stomach and probably also the duodenum or the pancreas in such a way as to produce duodenal obstruction.

DR. GATEWOOD The patient is now anesthetized with drop ether and I shall make the usual incision a little to the left of the midline just below the ensiform. Owing to the thinness of the abdominal wall due to the loss of weight the skin is very tough and leathery. This condition is characteristic of carcinoma but is found in other conditions in which there has been a gradual loss of weight. There are no adhesions to the anterior abdominal wall. The omentum as you see, contains hardly any fat. I cannot recall having seen a case in which the omentum was as fat free as the present one. The stomach lies almost entirely above the costal margin. It is very small and can be brought out of the wound for examination only with considerable difficulty. The walls are markedly thickened and there is a suggestion of hour-glass formation (Fig. 485) in the fundus. The entire stomach is no wider than my three fingers. There are several whitish scars on its surface. The duodenum is larger than the pyloric end of the stomach. The pylorus is thickened so that it is difficult to determine the exact amount of obstruction as I cannot place my finger through the pyloric ring. The pancreas seems to be somewhat enlarged and firmer in consistency than normal. On the anterior surface of the liver are several stellate scars so characteristic of syphilitic hepatitis. There can be no question as to the diagnosis. It is a case of *linitis plastica* accompanied by syphilitic hepatitis.

What operative procedure shall we follow? A good many cases of syphilis of the stomach are entirely cured on antibiotic

- 3 Stiffness and lessened pliability of the stomach wall.
4. Absence of peristalsis in the involved area
- 5 Pylorus gaping rather than constricted.
- 6 Six-hour residue less common than in other gastric lesions.

7 Hour-glass stomach upper loculus expanded and bulbous, lower loculus tubular owing to extensive irregular concentric contraction.

8 Patient usually under cancer age and not ill in proportion to the extent of the disease shown by the x-ray

The characteristic x ray findings are the result of definite luetic pathology. In the first place, a gumma may be present, producing a palpable tumor mass. This condition may be indistinguishable from carcinoma grossly the diagnosis not being established without the aid of the microscope. Second, such gummata may break down and give rise to ulcers of the stomach. Ulcer of the stomach may be present with or without sufficient new tissue formation to produce a tumor mass. In the third place as a result of gummatous growth or of contraction of localized or circumscribed fibrous areas, various deformities may be present. Perhaps the most frequent of these is the hour-glass deformity. It may usually be distinguished from the hour-glass of a peptic ulcer by the fact that the distal pouch has a normal or nearly normal wall, free from the deforming contractures characteristic of lues. Fourth, the most striking gastric lesion produced by syphilis is the generalized cirrhosis which produces a much thickened stomach wall in which on section one may see coarse interwoven strands of fibrous tissue from which the process has received its name of *linitis plastica*. It is this type of lesion which causes greatly decreased stomach capacity and the greatly thickened stomach wall which has given the lesion its other name—leather-bottle stomach. This is the lesion which was predicted in this case and which we have found. Of course not all stomachs to which this name is applied are syphilitic. A slowly growing scirrhus carcinoma may cause almost identical gross changes and require careful microscopic examination for nests or strands of cancer cells. Lastly syphilis

jejunum and some portion of the duodenum or stomach seems advisable. A duodenojejunostomy is theoretically the operation of choice. Technically however owing to the infiltration of the duodenum and its lack of mobility this operation would be very difficult. I shall therefore, do a posterior gastro-enterostomy. This may be exceedingly difficult on account of the infiltration of the stomach wall. I am unable to place a clamp upon the stomach and the operation has to be done without clamps. The usual three-layer gastro-enterostomy is finally done without leakage in a very satisfactory manner. I am now stitching the opening in the transverse colon to the jejunum instead of to the stomach to obviate the possibility of hernia. This is made necessary on account of the friability of the stomach wall. The abdominal wound is now closed in the usual manner without drainage.

The postoperative treatment in this case will not differ from that usually instituted in gastro-enterostomy except that as soon as the patient has sufficiently recovered from his operation antiluetic measures will be pushed. It will be interesting to observe at a later date whether the stomach regains its normal capacity or not and whether regurgitation from the duodenum into the stomach continues.

Syphilis of the stomach is by no means a common condition, although good many cases probably have been overlooked in the past. Eusterman reported 40 cases in a series containing 6000 cases of ulcer and cancer. While there seems to be some difference of opinion as to the gastric findings in syphilis of the stomach, probably most cases in which there is an extensive involvement as in the case we have seen this morning have achylia. Cases in which there is a fairly circumscribed lesion may have a normal or diminished acidity. Hyperacidity rarely occurs.

From a roentgenologic standpoint, Carman finds as characteristic the following

1. A filling defect of gastric outline usually without corresponding palpable mass.
2. Shrinkage of the gastric capacity

CLINIC OF DRS E. WYLLYS AND EDMUND ANDREWS

ST LUKE'S HOSPITAL

TWO CASES OF LAMINECTOMY IN THE LUMBAR REGION FOR TRAUMATIC PARAPLEGIA

(DISCUSSION OF THE DIAGNOSTIC POINTS DR. CHARLES LOUIS MIX)

CASE I

SYNOPSIS Patient with paraplegia resulting from an apparently slight injury to the spine. Presentation of history and diagnosis by Dr. Mix. Operation by Dr. Andrews. Result

Mix D This is a case of paraplegia following an apparently slight injury of the spine producing definite symptoms referring to the conus and cauda equina. Dr. Mix will present the history and analysis of this patient who has been under his care for considerable time.

DR. CHARLES LOUIS MIX The patient is a young man twenty-four years of age who says that while riding in a Pullman car in August, 1920 he attempted, as young men frequently do to muscle himself up between two seats that is he placed one hand on the back of one seat and the other on the back of the seat across the aisle and then attempted to raise his body between the two seats. In doing this his arms gave way and he fell to the floor a distance of about 4 feet. He struck upon his back. He immediately got up and laughed away the pain which the accident caused him saying that he felt all right and that he was not hurt. Nevertheless, he admits that he was hurt rather severely and that the pain was very great. From this time on he had pain in the back and early in September weakness began to develop in his left leg. The first thing that he noticed was dragging of the toe inability to extend the foot

may give rise to a chronic gastritis of low grade. This is a pathologic rather than a clinical entity.

The prognosis is good in most cases of syphilis of the stomach if energetic treatment be instituted provided the deformity of the resulting scar does not produce symptoms. Sometimes a chronic gastritis ensues which invalids the patient for a long time.

Postoperative Note (Dr. L. C. Gatewood).—The patient has been on active antiluetic treatment for about four months, with arsphenamin, mercury and iodid. His general health has very markedly improved. Recently he has been able to take 1 quart of milk at a time without regurgitation or vomiting. (Compare this with 6 ounces capacity before operation.) He has gained weight and is working every day.

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epicritic sense was lost as high as the level of the second lumbar segment.

The motor losses correspond in distribution to the sensory though they are more pronounced on the left side. For example the quadriceps extensor was very paretic on both sides and so also were his hamstring muscles, the muscles of the calf the anterior tibial and perineal groups. The extensors of the toes were more paretic than the flexors, and the grouping of the paretic muscles showed a disturbance practically coextensive with the disturbance on the part of the sensory nerves. There were no trophic disturbances in the way of ulcerations, but there was considerable loss of muscle mass in both legs, especially in the left, the measurement of which averaged from 1 to 1½ inches less than those of the right leg. Bladder control was present January 14th, but imperfectly. It was very difficult for the patient to start the stream or to control the stream when started.

Discussion.—The symptoms which are present are those of a lesion of the cauda equina. The loss of the knee-jerks and ankle-jerks, together with the absence of spasticity and the presence of flaccid paralyses and atrophy of the muscles corresponds to the peripheral type of nerve disease. This indicates an involvement of the nerve root rather than an involvement of the spinal cord. The absence of the Babinski reflex indicates that wherever the lesion was it was at least beneath the conus because in combined cauda and conus lesions we usually have a Babinski reflex present with absent knee- and ankle-jerks. Inasmuch as the territory was involved as high up as the supply of the motor centers of the second lumbar segment, it was evident that the lesion must be located where the fibers of the second lumbar segment issue from the spinal canal namely at the second lumbar vertebra. The sensory losses also aided very much in localization. There was the usual saddle-shaped anesthesia which is present in cauda equina lesions, but the sensory losses were much more than those found in ordinary lesions of the cauda for they extended up as high as the supply of the middle cutaneous branches of the anterior crural. Moreover there was sensory loss, especially of the epicritical sensibility in

a condition similar to that of toe-drop. Gradually the weakness extended, until in the autumn the right leg also started to show signs of weakness. Meanwhile the pain had continued in the back over the coccyx and over the sacrum, over the lumbar spine and over the pubic region, and down both legs. Associated with this pain he began to have sensory disturbances in the way of tingling and numbness until ultimately sensation was in part lost.

During the autumn he was treated by a 'practitioner' of some sort, who thought that the spine ought to be stretched. In the month of December he fell into the hands of a *naproth*, who thought that the back ought to be forcibly flexed and extended. During the last one of the treatments given him by this *naproth* he was suddenly seized with severe pains in the back. His legs became *immediately* worse so that he was completely paraplegic and could not walk and worst of all, he was unable to relax the sphincter of the bladder. His inability to urinate lasted about three days, after which control gradually returned. After the accident resulting from treatment by the *naproth* it seemed evident to the family that a man conversant with neurologic work should be invited in to make a diagnosis.

I examined the patient on January 14th. The findings were as follows. Both knee-jerks and both ankle-jerks were absent. There was, of course, no ankle-clonus and the Babinski reflex was absent on both sides. On the other hand, the superficial abdominal reflexes were present and strong and both cremasteric reflexes were present.

On testing out sensation it was found that the area of hyperesthesia extended as high as the level of supply by the second lumbar segment of the cord. For example the middle cutaneous branches of the anterior crural were anæsthetic and the patient could not feel in the territory supplied by the external cutaneous nerve. On the other hand, he felt very well in the territory supplied by the iliohypogastric nerves, which come from the first lumbar segment of the cord. The protopathic sensibility was pretty much present all over both legs but the

compression of the cauda. In view of the patient's critical condition—that he was paraplegic that his bladder control was very imperfect, that the pain was very pronounced and that there was considerable atrophy of the left leg—it was felt that the only proper treatment was a laminectomy. The location of the lesion was placed beneath the second lumbar vertebra though it was conceded that there might be trouble beneath the third. The upper level of the epicritical disturbance which is an extremely reliable localizing sign, occurred at the second lumbar segment of the cord or at the second lumbar nerve. This demanded the presence of a lesion, evidently as high as the second lumbar vertebra. Accordingly operation was planned to expose the cauda from the second to the fourth lumbar vertebra.

(Subsequent notes, April 26 1921. The patient left the hospital for Louisiana on March 11th. He was at that time quite recovered as to his ability to walk, though he still complained of pain in his legs. A recent communication from the patient states that he is able to get about on his legs, that power in his legs is already well established that his bladder control is perfect, and that his only complaint is still some pain at times in his left leg. While he was in the hospital his weight increased from 116½ to 128½ pounds on February 10th the first day he was able to stand up to be weighed. At present he weighs 145 pounds.)

Operation by Dr. Andrews.—The history you have heard leaves no doubt of the necessity of immediate interference before paralysis and profound paraplegia have resulted. Just what pathology we shall find in the canal we are not able to state, as the x-ray showed only a slight thickening of the bone posteriorly but it is probably of the nature of an osteitis and perhaps a dura cicatrix resulting from a periosteal trauma at the time of his fall. You will notice that our patient is in the prone position with the body slightly flexed backward, and the area from the middorsal to the sacral region exposed through our sheets and the skin prepared in the usual way. I make a median incision from the twelfth dorsal to the last lumbar spine, coming directly upon the bony prominences. The skin is then slightly retracted

the territory of supply of the external cutaneous nerve. For this reason it was felt that the lesion must lie at a level sufficiently high for the fibers leaving from the second lumbar segment to be involved. This would mean that the cauda equina must be affected very close to the tip of the spinal cord which ends opposite the second lumbar vertebra.

The location of the lesion was a matter of much greater ease than the conclusion as to the pathology present. It might be thought that the accident alleged was one of the usual trivial accidents always described by a patient in the presence of grave lesions of the spinal cord. Indeed the history of an accident is always forthcoming when any spinal cord lesion exists. The question that was uppermost was whether the lesion was a tumor or whether it was really due to a fracture-dislocation with compression and scar tissue formation. There are certain facts which help to a conclusion. Tumors are usually associated primarily with pain, and after weeks or months motor losses occur. The history in this case was a primary history of pain occurring in August, without motor losses until some time in September. To be sure, the motor losses followed the sensory disturbances much too quickly for an ordinary case of tumor but on the other hand, the sensory disturbances were rather suggestive as described by the patient, of root pains, which are commonly encountered in compressions by tumors. Spinal puncture was done for the purpose of arriving at more definite knowledge. It showed a normal cerebral spinal fluid. There was no increase in globulin or in the cell count and the Wauer mann reaction was entirely negative.

An x-ray was then taken for the purpose of demonstrating any possible fracture of the vertebra in the lumbar area. Careful study of the plates failed to show any signs of splintering of the vertebra or of the posterior lamina. Nevertheless the appearance of the second lumbar vertebra did not seem to be absolutely normal. There was too much shadow in the region of the left lamina though there was no sharply demarcated outline found in this region. It seemed likely that there might be some scar tissue formation opposite the second lumbar vertebra with

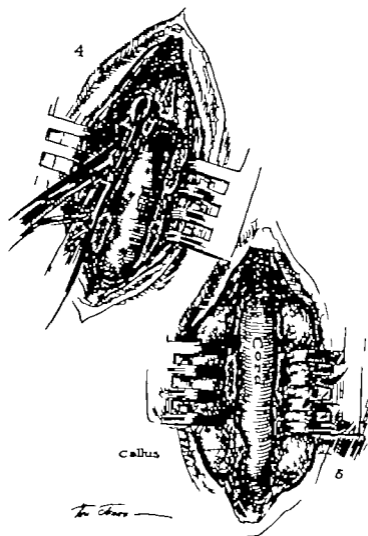


Fig. 487—4, Dividing laminae with rongeur. 5, These exposed, showing callus pressing on cord.

as far as the laminae the Fraxier retractor is inserted between these muscles and they are widely stretched apart. A similar

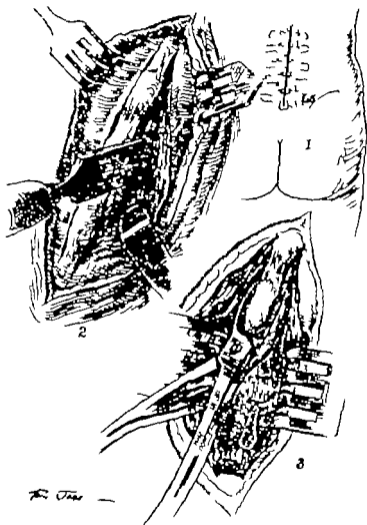


Fig. 484.—1, Incision. 2, Separating muscles from spine. 3, Cutting spine.

and the spinal ligament divided on each side allowing the periosteotome to be used to separate the large muscles from the

almost 50 per cent. of its diameter. I will with a flat, thin director explore upward and downward toward the dorsal and sacral segments of the canal. But I find no bony or other obstructions. It is, however, fair to conclude that we have by these alone—removal of the laminae and opening of the theca—released the cauda and conus from a mechanical pressure. The wound will, therefore, be closed in tiers, catgut sutures approximating the muscle, and the skin being somewhat carefully and rapidly reunited by separate sutures. I place a silkworm-gut drain in the wound for a few days projecting from the upper angle of the wound.

Our experience in these laminectomies has been that with care wound infection is almost unknown and that the operative recovery is almost 100 per cent. In the cervical vertebrae our statistics show a larger mortality from the immediate shock of the operation and a smaller percentage of cure. It is also our experience, confirmed by the work of all modern neurologists, that there is no hope of regeneration of complete transverse lesions of the cord proper. Hence, laminectomy has been disappointing in the upper and middle sections of the spine. It may be that removal of the blood-clots, of fragments of bone pressing upon the dura with or without laceration of its membrane will often be followed by recovery. It is also a fact that some cases of paraplegia from injury or even complete fracture, have recovered without operation. When we find in laminectomy above the cauda region, either from bullet wounds or from ordinary fractures with displacement, a complete severing of the cord we regard the operation as hopeless. In the lumbar region the exact opposite is true. We are dealing here with the branches of the peripheral nerves and the same law applies as in nerve trunks generally namely if they can be brought in close approximation regeneration can take place.

The after history in this case verified our good prognosis. Almost immediately improvement appeared in bladder function. Within the first two weeks marked change in sensation and motor power was manifest, and in four or five weeks it

Instrument has been designed by Dr Kanavel, of Chicago, and in the absence of these special retractors the ordinary Mayo-Collins abdominal retractor may be used. Spreading the blades with some force, we find that we can control the hemorrhage so that many small points do not require forceps or ligatures. The spinal processes and laminae are now fully exposed and each spinous process is removed with a large cutting forceps over the area of the laminectomy namely the second, third, and fourth lumbar vertebrae. After cutting these spines away the laminae are removed, and we wish to emphasize the great caution required in dividing these bony plates. You will notice we use a rongeur with very thin blades which bites away only $\frac{1}{8}$ cm. and that we do not insert the DeVilbiss, or any of the large broad forceps, with one blade in the canal. In this manner we avoid any possibility of thrusting our instruments into the canal, which might damage the cord. It requires from one to four bites upon each side to divide the lamina completely but the extra time is well spent, inasmuch as it avoids all danger of damage to the cord. This is not an imaginary danger and we have seen cases in which at this stage the cord or theca was obviously injured especially in the higher region of the canal. Having removed the three bony laminae the theca or dura is fully exposed. We now wish to call your attention to a step in the technic which we consider of importance and which we think we owe to the careful work of Frazier of Philadelphia namely the use of dry cotton rolls or cigarettes placed over the wound beneath the retractor blade, which prevents weeping of blood or serum into the canal at the time of opening the theca. You will see that these white rolls have absorbed any slight blood oozing and keep the canal entirely dry. We now open the theca or dura with a very fine scissors like those used by the eye men, taking extreme care not to wound its content. It is now obvious what is causing the pressure in this case. The spinal canal has been compressed mostly from behind by a thickening of the laminae especially that of the second lumbar vertebra and by thickening of about the same segments of the dura due to cicatricial deposits. The laminae have exostoses present encroaching upon the lumen

deformed spine. The patient hung between life and death for a few weeks, the paralysis of the thighs, legs, feet, bladder and rectum becoming less total, and after about ten weeks voluntary movement could be elicited of the knees, but not of the ankles, and the numbness, which was bilateral, included mostly the distribution of the external cutaneous, but not the ilio-inguinal. At this time it seemed wise no longer to delay laminectomy for the relief of the diseased canal, and this operation was performed under general anesthesia. Bony union apparently had taken place in the body of the first lumbar and in the lamina of the second, third, and fourth. The same technic was employed as in the first patient and a far more extensive bony deformity was found at operation. The laminae were greatly deformed and the lumbar spinal canal was reduced to the form of a flat ribbon not over 1 cm in diameter along which the cauda lay in a flattened condition. The deformity of the body of the first lumbar could be felt projecting upward into the canal, but no attempt was made to remove bone at that point, the unroofing of the canal by the removal of the laminae being considered sufficient. The naked-eye appearances were those of a greatly thickened dura and a periosteal and osteous thickening of the laminae and not a total severance of either the theca, conus, or caudal nerves. So far as noticeable the spinal foramina were not blocked and were not included in the operative work. The muscles were closed in tiers with catgut sutures and the skin with separate sutures, a small drain being used in the upper angle.

Primary union occurred in this case and the patient was kept in the hospital until a few weeks ago returning to his home for further treatment after removal of the stitches. Improvement set in after the sixth month and has been progressive since, but has not yet become, and probably will not be complete. He is now able to walk only by the use of iron braces to support the knees and ankles. With such braces he can get about somewhat freely. Whether re-education, tendon transposition or any orthopedic treatment can relieve him further we are not sure but, as the cord itself was in this

was so advanced that the patient could get about. From that time (January 1921) to the present the patient has been constantly gaining in strength. When last seen nearly all the signs of paraplegia had disappeared.

CASE II

Summary—Severe injury of the spine following a fall in an elevator. Early treatment in this case. Use of the air-bed in the prevention of bed-sores. Operation. Result.

Mr. G. fell seven stories in an elevator and received almost fatal injuries. He was brought to the hospital in extreme surgical shock, almost pulseless, and unconscious. Under restoratives he regained his strength and was found to have a fracture and dislocation of one ankle, a comminuted fracture of the other, and multiple injuries of the lower spine in oblique the body of the first lumbar and the lamina of the second, third and fourth, as shown by physical examination and by x-ray. He was completely paraplegic in the area supplied by the first lumbar segment of the cord. Reflexes were not abolished, and it was thought then at the early stage that the injury might be more to the cauda and due possibly to compression without destruction to the conus. I will call your attention to the early treatment in this case, which consists in placing him upon an air-bed and supplying artificial heat and stimulants. You are all familiar with the extraordinary rapidity with which bed-sores develop in paraplegia, owing as some think to the trophic disturbances of the paralyzed parts, or according to another theory to anesthesia of the sacral tissue allowing ischemic pressure over that point which is without sensation. At any rate, it is a fact that such patients will develop enormous bed-sores in a few hours or days if lying upon a hard mattress, no matter how carefully they may be watched. An air-bed or water-bed does away with this risk and should be the outcome in such cases. It must be employed early in order to avoid this danger. Without anesthesia the fractures and dislocations were reduced, and an extension upon both legs while upon the air-bed was employed to relieve the marked kyphosis of the

EXTRAPERITONEAL DRAINAGE OF A CHOLECYSTECTOMY WOUND

Summary—Patient giving history of recurrent attacks of pain in the right upper quadrant. Diagnosis Cholelithiasis. Treatment preparatory to operation. Operation. After-history

Mrs. N S aged fifty four entered the hospital April 12 1921 Family history is negative. Menstrual history is negative. Climacteric ten years ago She has had 3 children and has had no miscarriages. The labors were all normal. After the birth of her last child, when she was twenty-six years old, she had a severe sepsis. There is no history of typhoid. Three years ago she began to have attacks of severe abdominal pain in the right upper quadrant with radiation to the right scapular region, accompanied by nausea fever and chills. These attacks have gradually become more severe and more frequent. About ten years ago she began to have a chronic dyspepsia between the attacks, with frequent and severe headaches. She has never been jaundiced or passed any dark urine or clay-colored stools. The present attack began April 4th The same symptoms were present, but much more severe. She has vomited frequently the pains are much worse, and she has had some diarrhea. She was seen by Dr Mix on April 6th and he diagnosed a cholelithiasis. She was sent to the hospital for operation.

Examination showed rather obese woman with a temperature of 101 F pulse 96 and respiration 24. There was a subicteric tint to the conjunctiva. She was apparently in acute pain. Examination was negative except for the abdomen. We find marked rigidity and tenderness over the gall-bladder region. The liver is enlarged and is about 5 cm. below the costal border. The gall-bladder is palpable enlarged and is outlined about the size of an orange. White count is 15,500 red count, 4,500,000 hemoglobin 90 per cent. The urine

case traumatized, it is probable that the motor neurons can never be repaired and some permanent paraplegia must remain.

The most gratifying and positive result was the restoration of bladder function and control of the rectum. Sensory function is also nearly restored. Motor power is regained in a degree about 50 per cent. above his former condition.

and loose and comes off entire making it possible to shell out the gall bladder without tearing the peritoneum at all. Having gone down to the cystic duct, I will stop my dissection, clamp

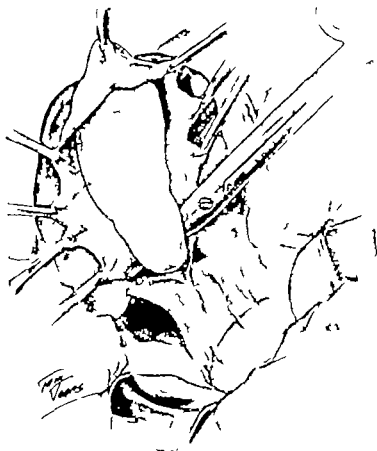


Fig. 453.—Gall-bladder partially shelled out, lying across.

and ligate. In view of the special danger from sepsis in this case I will not open the retroperitoneal tissue and will leave the stump longer than usual. I believe that the danger of recurrence in those stumps is far less than that of dissecting

shows a trace of albumin, a few hyaline and granular casts, but no bile. The stools have a normal color.

It is in just such a case as this that much of the mortality in gall-bladder work occurs. Operation in this stage of gall-bladder disease is a very dangerous thing. We have here the typical picture of stone in the gall-bladder accompanied by severe infection. Experience has taught surgeons that in such cases the only safe procedure is to wait until the sepsis is controlled, and that waiting entails but very little risk if the case is carefully watched. If we operate in this stage the danger of spreading the sepsis, especially through the large veins in the region, is very great, and the incidence of septic emboli is appalling. Therefore, absolute rest, with morphin by mouth and careful observation of the white count and temperature are indicated.

On the third day there was only one degree of temperature and the pain had partially subsided, but the count was up to 19,000. In the morning her temperature went to 102.6° F and all the symptoms were worse. On the following day it went to 103.2° F with a count of 20,000. Following this flare-up the improvement was rapid and steady until today the count is 10,000, with temperature of 100° F, pains very slight. I do not feel that the present is the ideal time to operate but I fear to wait any longer. We will, therefore, if the gall-bladder is very much adherent and difficult to remove drain it and cure the sepsis, and do an ectomy later if necessary. It is in the ectomy that the mortality runs highest in septic patients though ordinarily the two operations have no special difference in mortality particularly in this type of ectomy.

When the gall-bladder is exposed by right rectus incision and the other viscera are packed off we see that it is entirely free. It is covered by glistening peritoneum, which is slightly edematous and rather loosely attached. It contains one large stone as big as a small walnut and several smaller ones. The ducts are easily palpable and are normal, containing no stones. The cystic duct is very short and thick. I am now slitting the peritoneum the entire length of the gall-bladder. It is thick

on the flap through it. What I have done now is to close the peritoneum. The drain lies in the gall-bladder fossa or between the liver and the peritoneum. The abdomen is closed in the usual way with a row of catgut sutures reinforced by a few silkworm sutures.

Discussion.—This procedure is of course, the ideal way to deal with such a case. The drainage will not soil the peritoneum, which is well able to combat any infection spread at operation, and it needs no drain. The extraperitoneal spaces are amply drained and even if bile should leak out past the ligature, it will not enter the peritoneum and no jeopardizing mass of adhesions will be formed about my drain. Unfortunately however an operation of this type is rarely possible. Ordinarily we find the gall bladder so scarred and adherent and the peritoneum so compromised that the making of such flaps would be an impossibility. However it is always well to bear in mind, as, when possible I believe it to be much the best procedure.

After-history.—The day after operation her temperature went to 101° F. the second day to 100° F. and after that there was no rise in temperature. The drainage was slight, being only serous in character and there was no leakage of bile. The drain was removed on the seventh day and recovery was uneventful.

and opening into the retroperitoneal lymph-spaces which would be necessary to remove the whole cystic duct close to the junction of the common duct. I will now lay a soft rubber tube



Fig. 489.—Drain in gall-bladder lumen. Peritoneum closed over.

In the place where the gall-bladder was and suture the two flaps of peritoneum over it to cover it up. This drain will not be fastened with a ligature to the stump, as is my usual practice, but will be held in place by putting one of the sutures

CLINIC OF DRS EDWARD LOUIS AND LOUIS D MOORHEAD

MERCY HOSPITAL

WRY-NECK: TWO CASES—ONE CONGENITAL, THE OTHER ACQUIRED

Synopsis Etiology of wry-neck—classification, diagnosis, and treatment.
Presentation of two patients illustrating the congenital and acquired
varieties

We have two very interesting cases to present to you this morning. The first shows the end result after operative treatment for congenital wry neck. The second patient is suffering from the acquired form of the same condition, and as yet no means have been employed to correct the deformity.

Our first patient, Mr. L. J., is eighteen years of age, an American by birth but of Polish descent. He entered the hospital ten weeks ago and gave us the following history:

As far back as he could remember his head had been held fixed in a position of flexion to the right and slightly downward. There had always been a very marked limitation of motion, so that patient was accustomed to turning the entire upper half of his body when he desired to view objects about him. At no time had he suffered pain or tenderness in the neck muscles. His general health had always been good. He had suffered from the usual diseases of childhood. Venereal history was denied and a routine blood Wassermann was negative. His family history was negative and his habits seemed to be without influence upon his present condition. The general physical examination was negative except for the following points: The head was held in a fixed position flexed to the right and slightly downward. The right sternocleidomastoid muscle was much shorter than

right side of the neck. The pain came on suddenly and was accentuated if she attempted to rotate her head. A feeling of stiffness was experienced in the muscles on the right side of the neck, and in a few days the patient noted that her head was flexing to the right and slightly downward. As she describes it, the great cord on the right side of her neck was growing shorter and thicker. The pain and tenderness persisted. For a little time previous to the onset of the condition the patient recalls that she experienced trouble with the lower teeth on the right side, in fact, one tooth was ulcerated. During the past year the condition of the neck has remained about the same with the exception that pain did not remain constant, but has had acute exacerbations.

She has consulted various physicians for relief from her condition. One of the early procedures was the removal of the patient's teeth and the subsequent treatment of the gums in an endeavor to eradicate a possible focus of infection. At a later date another physician performed a tonsillectomy working most probably along the same basis. So far no form of treatment has furnished any relief from the acquired deformity.

General physical examination is negative except for the following notations. The head is held fixed in a position flexed to the right and slightly downward. The right sternocleidomastoid



Fig. 491.—Case II. Acquired wry-neck (acute form). A, Anterior view. B, Lateral view.

the left. The muscle stood out prominently in its entire course and the clavicular and sternal attachments were very clear. There was a definite bowing upward of the right clavicle the highest area of the convexity corresponding to the attachment

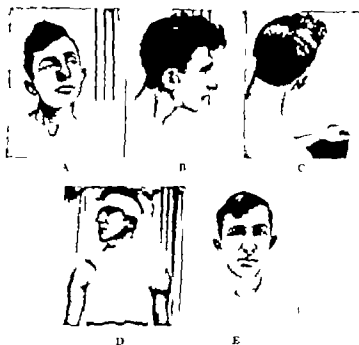


Fig. 490.—Case I. Congenital thyrotoxic (chronic form)

A, Front view

B, Lateral view

C, Posterior view

before operation.

Postoperative view: D, Cast applied. Head in overcorrected position.

E, End-result of operations. Position normal. Flexion, extension and rotation perfect.

of the sternocleidomastoid muscle. A compensating curvature of the cervical vertebrae was noted.

Our second patient, Mrs. B., is forty three years of age, an American by birth, she gives us this very interesting story. A little over one year ago she began to have a sharp pain in the

sternomastoid—are, however not infrequent especially in the acquired forms.

Torticollis is considered one of the less common deformities, and the acquired is by far the more frequent form. Statistics indicate that the occurrence is somewhat more common in females than in males and that the left side is affected more often than the right.

In most instances the deformity of congenital torticollis is slight at birth, and it may not attract attention until the child supports the head or even walks. Frequently as in the case of this boy the patient is not brought for treatment until the distortion has persisted for some years as a consequence of this it is often difficult to distinguish the congenital form from the deformity that may have been acquired in infancy.

Slight torticollis may be demonstrated even in early infancy and you accomplish this by fixing the shoulder on the affected side and drawing the head forcibly in the opposite direction, when the shortened muscle becomes prominent beneath the skin, evidently restricting the range of motion. The sternal division of the muscle appears, in most instances to be more shortened than the clavicular portion.

It is rare to see a case in which the deformity in infancy is extreme. When it does occur it is usually accompanied by well marked asymmetry of the face and even by distortion of the skull. In this class the shortening may involve all the lateral tissues, both anterior and posterior and is often complicated by malformation of the cervical vertebrae. If asymmetry is present at birth it increases somewhat with growth. Even in the acquired form it often appears soon after the onset of the deformity becoming more marked with its continuance.

Its cause is explained by most authors by the constrained attitude the restriction of normal use and consequently of blood-supply combined with the tension upon the tissues of the face as is evidenced by the fact that it becomes less noticeable after the deformity has been corrected.

In well marked cases of long standing whether congenital or acquired we sometimes note that the face on the affected side

muscle is contracted and prominent during its entire course. There is evidence of pain upon any attempt at rotation of the head. There is tenderness, particularly along the upper portion of the right sternomastoid muscle. The upper portion of the right trapezius muscle is contracted but not tender. A view of the mouth and pharynx shows that the teeth have been removed and the gums are in good condition. The tonsils also have been removed. There is some cervical adenopathy possibly a little greater on the right side.

Wry neck or torticollis is, as the name implies, a twisted neck, a distortion caused in most instances by active contraction or by shortening of one or more of the lateral muscles that control the head. Similar distortion may be due to disease of the spine, so-called false torticollis, but this should be classed as a symptom of the underlying disease not as simple torticollis of which the distortion itself is the important disability that demands treatment.

Torticollis may be divided primarily into two classes—the congenital and the acquired. These patients are representatives of the two types. Congenital torticollis is painless shortening of the tissues on one side of the neck of intra-uterine origin. Acquired torticollis is, in most instances, accompanied in its early stages by local pain and sensitiveness and by active contraction of the affected muscles. After a time these acute symptoms usually disappear leaving simply the deformity. Thus, from the therapeutic standpoint, torticollis may be classified as acute and chronic the latter cases including the congenital form.

The sternocleidomastoid is the muscle that is usually involved primarily both in the congenital and acquired forms; hence in typical torticollis the head is drawn somewhat forward and is inclined toward the contracted muscle while the neck is pushed, as it were away from the contraction; the chin is slightly elevated, and turned toward the opposite shoulder—an attitude explained by the normal action of the affected muscle. Irregular distortions of the head—as posterior or anterior torticollis due to contraction of muscles other than the

According to this theory the condition is caused by rupture of the muscle, probably at the time of delivery and by myositis about the resultant hematoma which may involve and ultimately destroy a large part of the substance of the muscle, replacing it with fibrous tissue, which contracting causes deformity.

Acquired torticollis is an affection usually of early life. It is unusual for the condition to occur in a person as old as our patient. While congenital torticollis is usually a painless shortening of the muscles, acquired torticollis is, as a rule a painful affection secondary to injury or disease of some of the structures of the neck, which causes irritation of the peripheral nerves and active contraction of the neighboring muscles. Thus, as a rule the number of muscles involved in the deformity is greater than in the congenital form for example in this woman we see that both the trapezium and sternomastoid are contracted. Irregular forms of distortion caused by spasm of other muscular groups are not uncommon.

For our own convenience let us consider the varieties into which acquired torticollis may be classified. They are

- 1 The simple or mechanical form, due to scar contraction following destruction of the skin or deeper tissues, as from burns or disease.

2. Acute torticollis caused by direct irritation of the muscle, by injury by inflammatory affections of the surrounding parts, combined in most instances with irritation of the peripheral nerves, which causes reflex contraction of certain muscles or muscular groups.

- 3 Spasmodic torticollis, a form of convulsive spasm defined by Walton as "a disorder of the cortical centers for rotation of the head."

- 4 Irregular forms of torticollis—paralytic, ocular psychic and the like.

Our second patient this morning fits into the second group of this classification.

One must be sure and consider the acute form of Pott's disease before he makes a positive diagnosis of acute torticollis. In the latter condition the affection is of sudden onset and is not

is shorter and flatter the nose and the corner of the mouth and eyelids are drawn downward and the skull shows evidence of atrophy and deformity.

As are evidenced in the case of this boy secondary distortions also appear in the trunk in chronic cases. These are rotation of the spine to compensate for the lateral distortion of the head and an increase in the dorsal kyphosis, "round shoulders," as we commonly call it. Upward bowing of the clavicle caused by tension of the contracted muscle is noted also.

The lateral distortion of the head is lessened in cases of long standing, the compensatory convexity of the cervical spine displaces the head and neck toward the opposite shoulder.

We wish to call your attention to the fact that the compensatory deformities are slight in infancy but they develop in later childhood, for in many instances the growth of the affected muscle is checked thus, an original shortening of $\frac{1}{2}$ inch as compared to its fellow may be increased to 2 or more inches in later years. This fact emphasizes the importance of treatment as soon as may be possible after the distortion is discovered. As has been stated, the important contraction is usually of the sternomastoid muscle but if the deformity is uncorrected all the lateral tissues become shortened.

Typical wry-neck caused by shortening of the sternomastoid muscles is by far the commonest form of congenital torticollis, but occasionally cases are seen in which the head is but slightly inclined to one side and in which the shortening appears to involve the lateral tissues in general rather than a particular muscle.

It may be assumed, disregarding the possible influence of hereditary predisposition, that congenital torticollis is, in most instances, caused by a constrained or fixed position in the uterus for a longer or shorter time before birth. It is, in fact a simple distortion and that it has in the majority of cases no deeper significance is proved by the fact that it may be easily and completely cured by simple division or elongation of the contracted tissues. We do not believe that the theory of Stromeyer as to the etiology of congenital torticollis is probable

ture, without drainage. When the wound had been dressed the second important step in the treatment was the dressing by which the maintenance of the head in the overcorrected position was accomplished.

A plaster-of-Paris splint was applied to hold the head in the overcorrected position. The chin was rotated to the right, since the right sternomastoid had been divided and then the head was flexed toward the left shoulder. The plaster included the upper thorax and neck and ran upon the back of the neck and surrounded the head, that is, the body from the diaphragm up was enclosed except the arms and the face. The splint was kept on not only until the wound had firmly healed but until the soreness had disappeared in the operation region—five weeks in this patient. During that time the splint was changed twice, so that it was at all times sufficiently rigid to maintain the overcorrection. After its removal active and passive movements were begun, and these are being continued.

At the present time you will notice that the boy is able to rotate and flex the head with ease. The result of this case is ideal. To the casual observer his former condition would not be suspected.

What of the treatment for our second patient? Viewing this patient today we may say that the treatment of her condition can be divided into three parts. First, during the acute stage hot applications and a firm wide thick collar of flexible cotton stiffened by several layers of adhesive plaster is an agreeable support, particularly if there is much pain second, an endeavor to search out and eliminate the focus of infection. This step seemed to have received considerable attention in this patient. Third, correction of the resultant deformity that sometimes occurs, as we have it here. When this condition has become chronic, it may be sufficient to overcorrect it under anesthesia and then maintain the head in the overcorrected position by means of the plaster splint already described. This treatment may be employed in relatively early stages of selected cases. As a rule, when deformity has been allowed to persist for six months or more its rectification will require division of the more resistant tissues.

preceded by the stiffness and neuralgic pain that characterize tuberculous disease. The deformity of torticollis is almost always of the regular type. The spasm and contraction of the affected muscles are apparent, and direct tension upon them is painful. If, however the tension is relaxed by inclining the head toward the contraction, movement of the head in other directions will be found to be practically unrestricted.

Congenital torticollis, if of moderate degree may be overcome in early infancy by methodical stretching of the contracted parts. One person fixes the arm and another draws the head gently but firmly in the direction opposed to the contraction, over and over again, meanwhile massaging the tissues of the neck. This procedure should be repeated several times a day. It causes slight momentary discomfort if properly performed, but this ceases when the stretching is discontinued. Care should be taken also that posture may as far as possible, favor the reduction of the deformity thus while the child is in its mother's arms the head should be supported, and when asleep the pillow may be arranged in a manner to prevent the improper position. In this way the torticollis may be entirely corrected or its progress may be checked until more effective treatment is indicated.

Subcutaneous tenotomy is an operative procedure that we believe should be mentioned only to be condemned.

The resulting condition in this boy you see is perfect. The treatment employed consists of two parts, each of equal importance. The first part is the operative procedure, and we did an open myotomy and faciotomy. This operation accomplishes all that is desired. In adults local anæsthesia may be employed but in this case ether was used. After suitable preparation the incision was made transversely about a fingerbreadth above the clavicle. The muscle was divided transversely and to protect deeper structures the division was made over a director inserted under the muscle. Both heads, the sternal and clavicular were divided for it is important to be able to overcorrect. When the muscles had been divided and the head had been tilted to the opposite side one band of fascia after another sprang into prominence, and these were divided with the knife working over the director. The wound was closed by a subcuticular catgut suture.

CLINIC OF DRS CARL BECK AND VERNE S CABOT

NORTH CHICAGO HOSPITAL

LIPOMA ARBORESCENS OF ANKLE-JOINT

Summary Lipoma arborescens of right ankle-joint occurring in patient previously operated on for spindle-cell sarcoma of the fascia lata of the right leg

Mrs C fifty four years of age has for the last five months noticed a swelling over the external malleolus of the right ankle. This swelling causes some pain in walking Five years ago she was operated by us for spindle-cell sarcoma of the fascia lata extending over the whole front of her right limb There has been no recurrence of the sarcoma since that time but the patient is afraid that this growth over the ankle may have some connection with it.

Examining the swelling over the ankle we find that it has the consistency of a lipoma, is lobular and easily felt through the skin. It is, however not freely movable, and seems to be connected with the joint in some way because on extreme flexion of the joint it becomes somewhat larger as though a portion of it had been pressed out from the joint Otherwise it seems to be closely connected with the capsule Since it is interfering with her walking and causes her considerable annoyance we have decided to remove it.

Operation.—An incision is made in the long axis of the limb Upon reaching the capsule we find that the tumor consists of a fatty lobulated substance exactly like the ordinary lipoma and that it has a small pedicle which connects it with a similar structure inside of the capsule (Fig. 492) After dilating the small perforation of the capsule we are able to extract from the inside of the joint cavity a mass about one third the

PARTIAL NECROSIS OF COCCYX DUE TO INJURY TWO YEARS PRIOR TO OPERATION

Mr. H. E. banker forty five years of age, comes complaining of tenderness over upper intergluteal fissure in region of coccyx. He states that the pain and tenderness have been present for the past two years and that both would disappear at times for a period of from several weeks to a month, only to reappear and last for several months.

On questioning, the patient gave the history of a severe fall on buttocks in the winter of 1918 with no apparent immediate after-effects. During the past six months, however he has noticed one especially tender spot over upper coccygeal region. This is markedly painful upon riding in a sitting posture especially in an automobile.

During the past two years he has had treatment for hemorrhoids and fissures as the probable cause of his trouble, but with no lasting benefit.

Family History—Father died of sarcoma of coccyx. The previous history is negative except for the fall on buttocks two years ago. Physical examination, on deep palpation, shows a definite mass about the size of an orange over posterior rectal wall. Proctoscopic examination reveals several small internal hemorrhoidal areas with a small fissure. No apparent connection between rectal and perineal condition could be established. During stay in the hospital prior to operation he occasionally had a temperature of 99.4° F. but not sustained, and without chills or sweats.

Urine examination is negative. Blood count shows 11,700 leukocytes with a normal differential count. Wassermann reaction is negative. Blood-pressure is 140 systolic and 85 diastolic.

Roentgenographic examination shows an irregular outline of the coccyx, with a suggestion of partial absorption of remaining portion.

size of the external tumor. We close this small breach in the capsule and unite the skin.



Fig. 492.—Dors. leg showing lipoma on the outside and inside of the capsule. The capsule is penetrated by the pedicle into the center.

The diagnosis is a lipoma arborescens, a pathologic condition which occurs quite frequently in the knee-joint, but is rather rare in the locality of the ankle-joint.

The patient made an uneventful recovery and was able to walk without pain a week later.

BILIARY FISTULA AND CHOLECYSTECTOMY

Mr. M. B. insurance broker aged fifty-eight, comes for relief of a discharging fistula located in a linear scar in upper right abdominal quadrant.

The family history is negative. Previous history, six years ago following a period of several years of gastric disturbance with attacks of colic in upper right abdominal quadrant, a diagnosis was made of cholelithiasis. He submitted to a cholelithotomy at which time many small stones were found. He tells us that the wound drained for ten days and that his recovery was uneventful. He remained free from symptoms for the next two years, when he began to again experience his previous chain of symptoms—right costal margin pain, colicky in type, with occasional chills belching nausea and epigastric distress but no jaundice. He was treated medically until three years ago when he again submitted to a drainage of his gall-bladder. At this time three stones each the size of a hazelnut, were removed. The drains were left in for twenty two days at this second operation.

He states that the second operation was attended with profuse hemorrhage which prevented the intended removal of the gall bladder. At this operation, following the removal of drainage-tube from the gall-bladder a small fistula remained. This at first discharged bile-colored fluid, gradually discharging less in amount during the first four months. From then to date it has remained unchanged. He says the discharge became less bile colored and more mucoid in consistency. This condition persisted for the past three years, and he is now seeking relief primarily for a cure of this fistula.

Upon further questioning he says that following the second operation he remained comparatively free from his previous complaints until six months ago. During this time he has had several definite attacks of colic without jaundice and also

Four days after admission, under general anesthesia a curved incision over coccyx was made and 300 c.c. of thick, creamy pus removed from a multilocular cavity. Pus contained several small particles which proved to be necrotic sequestra from coccyx. Remaining portion of coccyx was removed at this time. Abscess cavities were cleansed and packed. The wound was closed in part by one deep silk-worm-gut suture. The cavity closed rapidly by granulation and a secondary closure was made on the eighth day.

This case is of interest in that the primary cause of the trouble in all probability dated back two years with the intermittent periods of quiescence of his symptoms and on account of the history of sarcoma in his parent. The pathologic report was negative for sarcoma.

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occasional periods of nausea, belching, and anorexia. He does not vomit, but says he feels his best when stomach is comparatively empty and that heavy sweets or fatty foods increase his distress. There is no history of hematemesis, melena, or clay-colored stools.

General examination was negative except for the presence of a fistula discharging on the skin surface in upper right abdominal quadrant. The discharge was mucoid in character small in amount, yet necessitating a daily dressing. Roentgenographic examination of the gall bladder region revealed no visible calculi.

Operation.—Under ether anesthesia a Bevan incision was made from ensiform to level of umbilicus, passing to left of fistulous opening. The incision was then carried around the fistulous tract and the tract closed by suture and bound with gauze.

In view of two previous abdominal sections in this region many adhesions were anticipated. However the gall-bladder and adjacent tissues were remarkably free from adhesions. The gall-bladder was small, with thick, non-elastic walls, somewhat tense. The fistulous tract drained from near the fundus. On palpation a stone was found wedged in the distal portion of the cystic duct. It could not be dislodged by manipulation. Examination of remaining portions of biliary tract was negative for calculi or apparent pathologic conditions.

Using the fistulous tract as a tractor the gall-bladder was then freed from its liver bed from above downward and removed, including that portion of the cystic duct containing the calculus. The wound was then closed leaving a cigarette drain extending down to the stump of the cystic duct and also a gauze drain extending to the surface from the pouch of Morrison.

Convalescence was uncomplicated. The drains were removed on the fourth day and he returned home at the end of the sixteenth day.

The interesting features of this case are the presence of calculus, and the remarkable freedom of gall-bladder and adjacent tissues from adhesions in view of two previous sections.

PLASTIC OPERATION FOR TREATMENT OF LARGE EMPHYEMA CAVITY

Mr. W. B., an aviator twenty nine years of age, presented himself for relief of fistula in right lower chest following drainage of an empyema.

Previous History—He had the usual diseases of childhood, and enjoyed good health until 1913 when he had a pleurisy with effusion on the right side, which subsided without tapping with no apparent after-effects. In 1917 he had a right-sided mastoiditis, for which a simple mastoidectomy was performed. In 1918 he had a partial turbinectomy and septum repair. His family history was negative.

The history of his present ailment dates back to December 1919 when he had influenza, following which he developed a right-sided lobar pneumonia, with the crisis on the ninth day. He also had a pleural effusion, and upon his first tapping a diagnosis of empyema was made. He was tapped twice in the following week. He was then subjected to an intercostal drainage in the seventh interspace in the axillary line. Dakin's solution was used four times daily to irrigate the cavity. Everything was progressing nicely when, unfortunately, the drainage-tube slipped into the pleural cavity and after much manipulation an operation under general anesthesia had to be resorted to in order to get out the tube. It was necessary to resect the seventh rib to do this.

Tube drainage was continued and he drained steadily until he left the hospital in April, 1920. In May the tube was removed, the wound closed, and the patient gained in weight. He left for the Pacific Coast in June. He pursued his work until the latter part of August of the same year when he again began to lose in weight. Loss of appetite, elevation of temperature, productive expectoration, and the signs of another

accumulation of pus were apparent. Numerous examinations of sputum were negative for tuberculosis.



Fig. 493.—Roentgenogram showing empyema cavity before injection of blanch.

Another accumulation of pus being diagnosed a costal resection with adequate drainage was deemed necessary but refused, so intercostal drainage was again resorted to drainage being introduced through the old wound. It was maintained

for the next three weeks, with irrigation every two hours with Dakin's solution and the wound again allowed to close. He gained 10 pounds in weight and resumed his work in November only to have a similar recurrence again in December 1920 when we first saw him.

Physical Examination—The chest examination showed a retracted lung apparently with no adhesion at the apex, but the basal portion seemed adherent to the diaphragm (Fig. 493). The fact that some of the fluid of the Dakin's solution escaped through the larynx, and the fact that even if this did not happen he could taste these injections, made it certain that he had a bronchial fistula, although a very small one. Bismuth injection (Fig. 494) revealed the same condition as the clinical examination, namely an old incurable, large cavity with retracted lung which spontaneously or with ordinary treatment, would not close.

The catheter which was daily introduced to the extent of 6 to 8 inches drained only a limited quantity of pus. As it was introduced it passed into a narrow channel which grasped it tightly and did not permit any pus to pass along it. When the catheter was removed, however a gush of pus indicated that there was a pus-pocket which was not emptied by means of the catheter.

During the daily dressing the nurse found only the external portion of the catheter in the dressings, about 7 inches of it having been sucked into the cavity by a coughing spell (Fig. 495). With the aid of a urethral endoscope we located the red rubber tube and extracted it without operation but this accident hastened our determination to undertake radical treatment namely to resect a large portion of the front and side of the thorax, and to implant the skin-flap as a lining of the chest cavity.

Operation.—Under general anesthesia we incised the chest wall and resected the fourth fifth sixth, and seventh ribs to the extent of about 3 inches in width. We incised the very thick pleura and found the lung retracted toward the hilus, the apex perfectly free and hollow to the extent of a fist (Fig. 496).

We made a tongue-shaped flap with a base toward the axilla, and turned it with its point to the hollow of the apex cavity

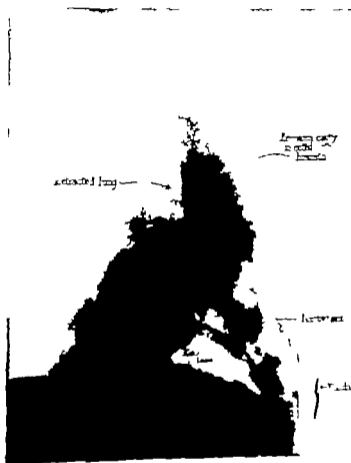


Fig. 494.—Roentgenogram showing empyema cavity after injection
basically

and packed several pieces of gauze into the cavity to keep the flap in place (Fig. 49)

Subsequent note For the first time in a few weeks the patient is free from fever The flap heals perfectly in position,



Fig. 495.—Roentgenogram showing catheter position and point at which catheter was sucked into cavity by coughing spell.

the cavity gradually discharges less pus, and the quality of pus becomes more serous. On the eighth day the patient is up and around and from now on the cavity will gradually heal with

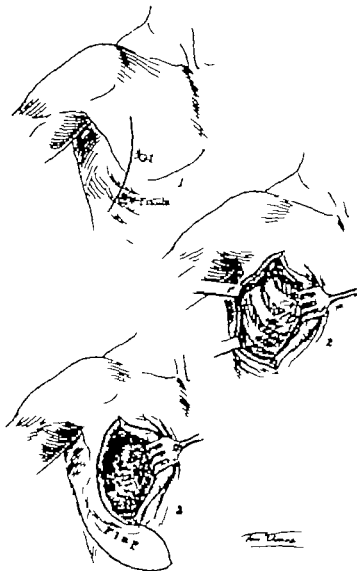


Fig. 496—1, Appearance of chest before operation. Line of incision. 2, Ribs exposed, ready for resection. 3 The rib removed. The thickened pleura anteriorly removed for considerable extent exposing large cavity. Outline of flap.



Fig. 197—4, The flap inverted into the cavity is kept in position by packing gauze in cavity. 5, Suture of the wound borders which can be approximated, showing lung in the lower part. 6, Drawing showing appearance of chest after one week.

scar and epidermis. There will be as the picture (Fig. 498) shows, a deep recess in that side of the chest.



Fig. 498.—Photograph showing deep recess in that side of the chest.

POSTOPERATIVE APPENDICAL FECAL FISTULA

Mr. H. M. thirty-one years of age, and a candymaker by occupation, came complaining of a discharging fecal fistula in the right lower abdominal quadrant of three months duration.

Previous History—He said that he had always been well until the present trouble. He denied all venereal infection.

The present trouble dated back five months, when he was taken with an acute right lower abdominal pain, nausea, and vomiting. His physician advised immediate operation for an appendical infection, to which he finally submitted on the sixth day. At operation the preoperative diagnosis was substantiated, the appendix having ruptured and a localized peritonitis was found to be present.

As his previous hospital history was not available, his narration of his case was accepted. He said drainage was instituted at time of operation, a glass tube being retained in the wound for three weeks which was then replaced by a rubber tube drain for nine more days, at which time the tube could not be kept in place because of diminution of the caliber of the tract.

He told us that drainage was profuse for the first week and then subsided but drainage was continued for three weeks more. He left the hospital at the end of the second month but a fistulous tract remained in the lower angle of the wound which discharged fecal matter. His surgeon on two occasions attempted closure by freshening the fistulous borders and suturing, but without success. Three months later he presented himself for relief of a fecal fistula.

Examination of the abdomen showed a scar in the right lower quadrant, probably a pararectal incision, 3 inches in length extending downward from the level of the umbilicus. At its lower angle there was a raised area the size of a quarter

which appeared to be mucous membrane. The surrounding area showed inflammatory reaction due to discharge from the fistulous tract. The discharge was fecal in character (Fig. 499).

Examination of the fistula showed direct connection with the bowel, with no apparent accessory fistulae or sinuses.

Roentgenographic examination was not followed out because of the easy demonstration of the fistulous area.

The operation was carried out under local anesthesia at the patient's request. The area was thoroughly cleaned and the



Fig. 499—Photograph before operation showing fecal fistula in abdomen.

opening of the fistula closed by a row of uninterrupted sutures to prevent further soiling of the operative area temporarily.

An elliptic incision was made about the external opening of the fistula, carrying it down to the peritoneum. The large bowel was then freed and brought up into the field. The opening in the bowel which involved more than half of its circumference was sutured definitely after removal of temporary sutures; a transverse section, and peritoneal surface sutured separately over the united edges of the fistula. Considering the inability to keep the field aseptic, a small drain was inserted into the neighborhood of the united bowel. The peritoneum and fascia were closed with interrupted sutures over the bowel. The skin



Fig. 500—Photograph showing application of lead plates to bring wound borders together

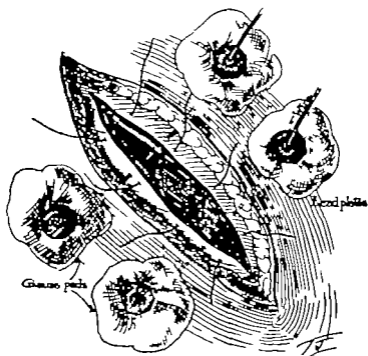


Fig. 501—Diagrammatic sketch showing application of lead plates

was excised so as to get broad surfaces together. Primary union was not expected, but when the bowel is sutured and kept far below the fascia so that it cannot adhere to the skin (lip fistula) a fistula will usually close by secondary union.

The patient remained free from any further suggestion of recurrence until the sixth day when the swelling over the wound again appeared. The skin sutures were removed and a fecal discharge appeared. Our repair had not been a success primarily. There appeared a broad separation of the wound



Fig. 502.—Photograph after operation showing wound completely healed

borders and one week later under local anesthesia a closure was again made. The bowel was again sutured—deep fascia imbricated over the area and two silver wires passed transversely over the fascial imbrication the wires passing several inches beyond the wound margins, engaging the fascia laterally and passing outward through the skin (Fig. 501). By this means tissues were brought forcibly together over the area of intestinal repair. The wires were held in place by large plates to distribute the tension over greater skin surface (Fig. 500).

Following the second closure there was no further fecal discharge and on the ninth day the silver wires were withdrawn (Fig 502)



Fig 503 — Roentgenogram after operation showing cecum filled with barium and former fistula closed

This case is of interest in that a fistula involving the major portion of lumen of bowel is often treated by resection, which

by above procedure was obviated. Subsequent Roentgen examination failed to reveal any indication of structure of the bowel at point of repair (Fig. 503)

The case is also clinically remarkable for it teaches us not to use drainage of hard material, particularly glass, for too long a period because of the danger of pressure necrosis.



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CLINIC OF DR. ARTHUR DEAN BEVAN

PRESBYTERIAN HOSPITAL

X-RAY BURNS

Summary Presentation of 2 patients with x-ray burns of the leg, one following treatment for psoriasis and the other for eczema. Treatment of burns by removal of damaged tissue and skin grafting. Results very gratifying following this method.

One of the most important of the unusual problems that have presented themselves in the last twenty five years since the discovery by Roentgen of the x-ray has been the subject of x-ray burns. Fortunately I am able to show you 2 of these cases *this morning*. I shall operate upon one the other I operated upon several weeks ago and I can present the case to you and give you the history and show you the result.

A few months after Roentgen's announcement of the discovery of the x-ray one of my friends here in Chicago Dr. Otto L. Schmidt, developed at a good deal of expense an x-ray laboratory and placed it in charge of Mr. Fuchs. Dr. Schmidt deserves a great deal of credit for doing some of the pioneer work in this country with the x-ray and enabling us here in Chicago to familiarize ourselves very early with the use of the x-ray both as a means of diagnosis and as a means of treatment. In fact Chicago was at the beginning the hot-bed in which much of the early x-ray work in America was done. For instance we did here the first work in the use of this agent as a means of diagnosis in kidney stone. Dr. William Allen Pusey of Chicago, and one of my associates, Dr. Joseph F. Smith now of Wausau, Wisconsin did some of the earliest work with the x-ray.

means of treatment in lupus vulgaris and, as you all know Dr Pursey and Dr James Nevins Hyde and his associates, Dr Montgomery and Dr Oliver S. Ormsby have done pioneer work and exceptionally good work in the use of the x-ray in epithelioma and in skin lesions. Dr Nicholas Senn was one of the earliest men to use the x-ray in leukemia and in Hodgkin's disease.

Immediately following the introduction of x-ray work it was first noted that it would produce a falling out of the hair of the beard or scalp. Very shortly afterward serious burns from the use of the x-ray began to be reported. Within the first few weeks of the use of the x-ray in Dr Schmidt's laboratory several serious burns were produced, some of which led to malpractice suits, and were tried out in court. It was unfortunate that in some of these cases in spite of the good intentions of the men using the x-ray and their lack of knowledge of its destructive effects juries returned verdicts for the plaintiffs in these law suits. Of course the early use of the x-ray was rather crude, and we were ignorant of many of the facts which are now clearly understood. We are at present in a position where we can speak with considerable knowledge in regard to the destructive effects of the x rays and in regard to the serious consequence of x-ray dermatitis with resulting carcinoma and x-ray burns with greater or less destruction of tissue. M Fuchs who began the work in Dr Schmidt's laboratory developed very early a dermatitis, and later as did many of these x ray operators, died of carcinoma.

To many of you this may seem an old story and yet some of the younger men who did not live through this period do not realize the risks that these early x-ray technicians ran. I do not think it an exaggeration to say that most of the early x ray technicians died of carcinoma developing in x-ray dermatitis lesions of their hands. The experts of today realize these dangers and protect themselves against dermatitis and against producing x ray burns in their patients in large part, although I still occasionally see an x-ray burn that has occurred in the hands of an expert. Unfortunately many of the men using x-ray machines today are not experts and are not familiar with the risks and

dangers, and x-ray burns are, therefore still common and occur largely in the hands of these men.

In the case we shall operate on this morning a young man of twenty-five was treated for peborlads of the leg with the x-ray and unfortunately received very massive treatment, which resulted in producing an x-ray burn about 5 or 6 inches long and about 3 inches wide, over the anterior surface of the leg about midway between the knee and the ankle. At first it seemed as though this was not very deep and it finally under careful treatment, very slowly healed up leaving an area of low vitality but which finally entirely covered over with thin epidermis and scar tissue. A couple of months ago he bruised this scar and it broke down became quite painful, and gradually extended into a large slough about 4 or 5 inches long and 3 inches wide. This case came into the hands of a colleague of mine and some weeks ago he brought him to my service. I advised operation, dissecting out of the tissue that had been damaged by the burn and skin-grafting of the area. The man had pain in the burn, as most of these patients have. In his particular case the pain was not as severe as usual, but for several weeks he has been taking small doses of morphin to control the pain. He has lost weight and strength and he is very nervous and mentally depressed because of his condition.

We shall do this operation under a general anesthetic and select ether for that purpose. The left thigh has been prepared so that we can take the skin-grafts from the same limb as the burn which I think as a rule is a good thing, leaving one limb perfectly free from bandages or dressings. This gives the patient I think as a rule more comfort than to put both limbs out of function by the operation. You will notice that there is a thick scab covering this area, a dark brown and dry scab. Underneath this is some pus. I begin my dissection going very wide of the damaged skin, at least $\frac{1}{2}$ inch outside of the destroyed skin. I think it is the safer plan to do this because my experience has been that if I make the dissection too close to the damaged area we may leave some tissue which is not grossly involved, but which heals very slowly. As I raise up this dis-

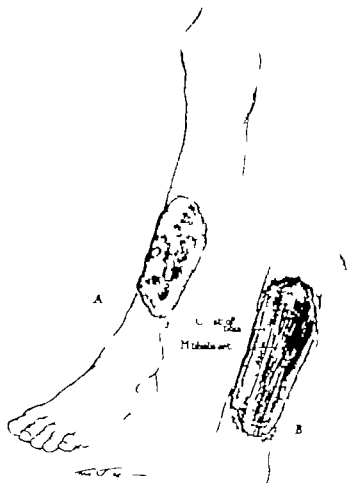


Fig. 290—A, Ray horn of leg. A large gangrenous area, somewhat elevated by bed of pus. B After excision of entire necrotic area. Not exposure of tendons and the anterior surface of tibia.

section you will notice that the scab and the destroyed area go down very deeply involving not only the skin but the superficial fascia and the deep fascia and a thin layer of muscles on the anterior layer of the leg. I dissect this up very carefully and finally remove in one block of tissue all of the damaged structures. From some standpoints it would be better to cover this large area with a flap of the entire thickness of the skin and superficial fascia, making a pedicled flap taking it from the other limb. I have found however that covering these areas with good Thiersch grafts as a rule gives excellent results, and is, on the whole very much simpler and more satisfactory. My dissection now leaves an area about 7 inches long and 4 inches wide. You will notice that we have exposed not only the anterior group of muscles of the leg but that the destruction also involved the periosteum on the anterior surface of the tibia, which comes out with this large eschar we have removed. I also uncovered the peroneal muscles on the outer side of the leg in the dissection.

Beginning now with our skin-grafting, I split the thickness of the skin of the thigh by a sawing motion with a very sharp razor ground perfectly flat on one side. The first ribbon, as you see, is about 2 inches wide and about 4 inches long. This is accurately placed on the exposed area of the anterior group of muscles and one after the other. As you see it is necessary for me to cut five good-sized ribbons of half the thickness of the skin in order to close the area completely. I now cover these skin-grafts with one thickness of gauze very carefully applied. I can see through it as one can see through a veil and see that I have brought the gauze flatly and smoothly against the skin-grafts and keep them very accurately in contact with the raw surface. Over this I now place several thicknesses of sterile gauze and over this a sterile gauze roller about 5 inches in width. Over this again I put on a starch bandage covering the entire dressing and allow the starch to dry and to fix the dressing accurately in position. This dressing will be left on for four or five days if there is no reaction, and then very carefully removed so as not to lift the grafts up from their bed.

I shall now show you the second patient upon whom we operated about three weeks ago and give you the history of this case and use this other patient as a means of describing fully the after management in these cases and the after history

This patient, a lady of seventy a patient of Dr Ormsby was treated with the x-ray for eczema of the leg and, unfortunately in someone's hands, not Dr Ormsby's, received a very severe burn about 5 inches long and about $2\frac{1}{2}$ inches wide on the anterior surface of the leg in about the same position as this patient. She has kindly consented to allow me to show you this case. This patient has been bedridden for a great many months on account of this burn, principally on account of the severe pain which she has been experiencing. I want to discuss the pain of an x-ray burn with you because it is one of the most important features. The pain of an x ray burn seems to me to be very much like the pain in senile gangrene due to obliteration of the blood-vessels and starving of the nerves of their normal supply. The pathology of the two processes is fundamentally the same because in an x-ray burn the essential thing is the gradual obliteration of the blood-vessels, and where necrosis occurs it is due to the fact that obliteration of the blood vessels is so complete as to no longer supply the necessary amount of blood to the part. The pain of an x ray burn is, as a rule very severe and sometimes excruciating. In many of the cases the patients become users of morphin, driven to it by the severe pain. In several cases where we have had x-ray burns about the anus, produced in the efforts to cure pruritus ani, the pain has been agonizing especially when the patient had a bowel movement, and at this time sometimes requiring 1 grain or 2 grains of morphin to control the pain and to permit of a bowel movement. There is one very characteristic thing about this condition, and that is, as soon as we dissect out completely the tissue damaged by the x-ray the pain almost at once disappears. I have had many patients make that statement to me and that is confirmed also by the striking fact that many of these patients who have been taking considerable amounts of morphin are

quite willing to very soon discontinue completely the use of the narcotic.

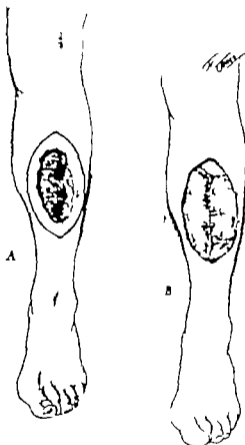


Fig. 191 — Ray burn of leg. Not side excision of entire area and application of large Thiersch grafts.

In this lady's case we did the operation under ether and in exactly the same way as you have witnessed this morning. The immediate effect was the relief from pain and in spite of the fact

that she was in an extremely nervous condition owing to her long confinement (she had been in bed more than four months on account of the burn) she expressed herself as being most grateful for the relief from the pain that the operation had afforded. At the end of a week I made the first dressing and found that all of the grafts had taken. Now you will see at the end of three weeks the entire area is perfectly healed there still being simply at the margins narrow scabs covering the junction of the grafts and the line of the incision, and also two narrow scabs running up and down the area marking the position of the junction of the two skin-grafts.

This patient had not walked for more than four months, and on account of the pain had kept the right limb the damaged limb perfectly quiet during that time and obtained a very marked fibrous ankylosis of the knee as a result. It was with difficulty that I could encourage her to bend the limb and to attempt to use it in walking but she is now able to move the limb and able to walk with the assistance of a nurse gradually recovering her strength and weight, and within a short time will be able to leave the hospital.

Nothing is more gratifying than a case such as this where we can relieve the patient of a serious condition such as an x-ray burn by completely removing the damaged area and are able to cover the raw surface from which the destroyed tissue is removed with normal skin, and obtain good complete wound healing, with resulting freedom from pain and return of function. I think, as a rule, where the x-ray burn is serious you will save a great deal of time instead of handling the case as is frequently done for months with various dressings and salves, if you will as soon as you recognize the fact that a certain portion of the skin is so much damaged that it cannot repair itself take radical steps and remove the damaged tissue and cover the area by skin-grafts.

We have fortunately or unfortunately on our service handled probably from 25 to 30 of these x ray burns in a series of years. In a few cases we have seen carcinoma develop in the damaged area. I am inclined to think, however from my knowledge of

the subject and from my own personal experience that epithelioma is not as apt to develop in tissue that is so greatly damaged by the x ray that it completely loses its vitality as it is in the minor lesions which are classified as x-ray dermatitis. In a large series of x ray burns I can remember but 3 epitheliomas that have developed in these lesions. On the other hand the cases of x-ray dermatitis which I have seen in the hands of x ray technicians have in the majority of cases ultimately resulted in carcinoma.

Do not these cases preach a sermon? Must it not be perfectly clear to every one that the x ray should not be used by untrained hands, and that it is a very powerful agent that may do much good or may do much harm? Burns may occur even in the hands of the greatest expert. When we refer a patient to an x-ray laboratory for x ray treatment we should feel confident that the x-ray treatment will be given by some one who realizes the dangers, and who is sufficiently well-trained to reduce the chances of burning the patient to a minimum and to a very small fraction. I think this is the first lesson taught in this sermon and the second is that to cure these patients we should very early resort to the removal of the damaged tissue and to skin-grafting both for the purpose of curing the patient of his immediate disability and of making as remote as possible the development of a resulting epithelioma.

TWO CASES OPERATED ON UNDER LOCAL ANESTHESIA —ONE AN ACUTE APPENDICITIS AND THE OTHER A CARCINOMA OF THE PYLORIC END OF THE STOMACH

Summary Case I—Acute appendicitis in man of eighty suffering from sarcoma of the sternum. Advantage of local anesthesia in case of this kind.

Case II—Carcinoma of the pyloric end of the stomach in man of seventy-eight. Anterior gastro-enterostomy—technic employed. After history.

I DESIRE to present to you this morning 2 cases of unusual interest. The patients are both old men one eighty and one seventy-eight, requiring surgical treatment, and they are both so handicapped because of their age and organic disease that a general anesthetic, either ether or gas and oxygen, seems distinctly contraindicated and on that account I shall attempt to do both of these operations under local anesthesia.

The first patient is a man of eighty who has been in the Presbyterian Hospital under the care of Dr B W Sippy and my associate, Dr D B Phemister. He has been here for several weeks suffering from what is apparently a sarcoma beginning in the upper end of the sternum especially the left side of the sternum. A section of the tissue has not been obtained but the physical examination and careful x-ray examination of the chest seem to exclude a diagnosis of aneurysm or of any other lesion except that of primary sarcoma of the sternum. The patient has a very bad heart. Outside of the heart trouble and sarcoma

of the sternum his general condition is good for a man of his age. Last night he was suddenly seized with a very acute pain in the abdomen. This was at first general but finally has localized about the appendix. He has become quite distended and the abdominal muscles are very tense distinctly more marked upon the right side than upon the left. The urine is normal. The leukocyte count is 16,000. His pulse and temperature are practically normal.

Dr Stippy and I studied the case with a good deal of care and because of the findings and by excluding other possible lesions that might give a similar picture we have arrived at a clinical diagnosis of appendicitis. The case is so acute and the abdomen is so tense with beginning tympany that we do not feel warranted in allowing him to go on without the benefit of an exploratory operation. Because of his heart condition I agreed to do the operation under local anesthesia. I have explained this to the patient, and he is quite willing to have the operation and have it done under a local anesthetic.

The patient has been prepared and, as you will notice, the abdomen is very much distended very rigid and exquisitely tender over the right lower quadrant (Fig 392). I begin by infiltrating the line of the usual appendix incision with a solution of $\frac{1}{2}$ of 1 per cent. novocain with 1:100,000 adrenalin. I use, as you see, a very fine needle for the first injection, and then infiltrate the skin for a distance of about 6 or 7 inches in length, then the superficial fascia and then, introducing the needle a little deeper I feel that I have passed it into the layers of the abdominal muscle. One cannot distinguish distinctly between the needle passing through the internal oblique and transversalis, but one can feel quite distinctly that the needle does pass into the external oblique. I now make a long incision, about 6 inches in length, through the skin and superficial fascia and then infiltrate the external oblique with two or three syringefuls of the solution. I now divide the external oblique and retract the edges of the incision widely, expose the internal oblique and infiltrate this in the same way. This part of the operation is quite painless. You will notice that I have used the novocain solution very freely and have already used about 3 ounces of it. Taking two dissecting forceps without teeth and with blunt dissection I separate the line of the fibers of the internal oblique and transversalis and expose the peritoneum. I retract the internal oblique and transversalis and the edges of the external oblique with four retractors, two in the hands of each assistant, exposing the peritoneum for an area of about 2½ inches in diameter. I then very carefully infiltrate the peri-

toneum. I do this because the parietal peritoneum is very sensitive. I then divide the peritoneum making an opening about $2\frac{1}{2}$ inches in length. The ascending colon at once comes into view and I draw this out gently with two pairs of dissecting

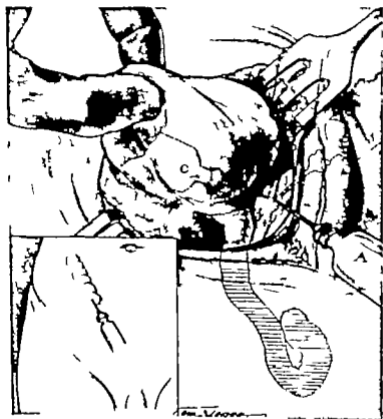


Fig 392 — Acute appendicitis. Insert shows method of infiltration. Note injection of mesentery of appendix (A B C D) before removal from abdomen. Appendix shown by shaded area.

forceps without teeth, and with a syringe of novocain solution I infiltrate the mesentery at the ileocecal junction. In spite of the fact that I have drawn the bowel out very gently this has given the patient some pain especially when I make an effort

to draw the appendix into view. Following down the ascending colon toward the cecum I now pull the cecum into view but find that I cannot bring the appendix out of the abdomen on account of adhesions. I use another syringe of the novocain solution and inject the mesentery about the appendix. With artery forceps on the appendix, first at its base and then applying the forceps about $\frac{1}{2}$ inch further down and then another $\frac{1}{2}$ inch until I reach the end, I finally draw the appendix out of the abdomen. At the same time I do this I very gently separate with my gloved finger the adhesions which surround it. I now have the appendix entirely free and you see it is curled up on itself. It is about $3\frac{1}{2}$ inches long. The last inch is curled up on itself and is gangrenous. Fortunately it has not perforated and there is no free pus in the peritoneal cavity. The patient had, as you could see, during the few moments that I was bringing the appendix out from its surrounding adhesions considerable pain, but now that the appendix is free the pain has disappeared entirely and we can without any distress whatever complete the operation.

I first ligate the mesentericocolum with catgut and then crush the appendix with heavy forceps about $\frac{1}{2}$ inch from the cecum, ligate it at its crushed point with black silk suture and cut off the portion of it beyond the ligature. I touch the stump with half a drop of carbolic acid, which is then carefully wiped off and invaginate the appendix with first a linen purse-string suture and over this a suture of fine catgut. I then close the abdominal wound of the muscle-splitting incision with very fine catgut for the peritoneum, silkworm-gut for the internal oblique and transversalis and external oblique using two silkworm gut sutures through the skin, superficial fascia and external oblique so as to obliterate the dead space in this abdominal wall, which would be quite large because of the depth of his superficial fat, which is, as you see, about $1\frac{1}{2}$ inches in thickness. I leave in a small spilt rubber tube, which, however I expect to remove within forty-eight hours.

I am glad of the opportunity of showing you this case because it demonstrates, first, the use of local anesthesia in cases of this kind. If it were not for his heart condition I should have

given him a few whiffs of nitrous oxid gas for the few moments of the operation in which I was separating the appendix from its adhesions and bringing it out of the abdominal incision. You might say to yourselves that a demonstration of this kind shows that an appendectomy in a very acute case can be successfully done under local anesthesia and that, of course, is true but it certainly is not the best method to adopt in the usual case. I have no hesitancy in strongly recommending as the anesthetic of choice ether in the ordinary appendix operation. I have in my own experience had one series of over 1000 consecutive cases of removal of the appendix between attacks in which ether was used as the anesthetic without having a single death. Such a series is, to my mind, a very strong argument in favor of ether as being certainly a safe anesthetic. It is also very efficient. You secure complete relaxation and what is very important, you place your patient in a condition in which he is entirely unconscious of the operative procedure. Taken as a whole I would recommend as I have said ether as the anesthetic of choice in appendectomy particularly in acute cases. One might employ gas and oxygen as we have done in many appendectomies. It is however not as satisfactory as ether as a routine. It does not obtain as complete relaxation and on the whole is certainly not as safe as ether. I believe however that all three methods have a place and that each one has a perfectly legitimate field of usefulness in abdominal work and in the case that we have just operated on weighing all the evidence I would advise as we did in this case the use of a local anesthetic.

The dressing is now applied and the patient is quite comfortable.

After-history.—The following morning the patient was able to sit up in bed read his paper take liquid nourishment, and was very comfortable. He did unusually well for a week following the operation. He was very cheerful and very happy over his recovery in spite of the fact that he still had the heart lesion and the sarcoma of the sternum. During the night after the nurse had left for a few moments he died evidently very suddenly from a heart attack. It was impossible to obtain a

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postmortem examination of the case, but there is little doubt of its being a *sudden heart death* due to his old heart trouble, though one cannot exclude the possibility of pulmonary embolism in the absence of a postmortem examination.

CASE II.—Our second patient is a man of seventy-eight, a veteran of the Civil War who was referred to me by an old colleague of mine with whom I studied medicine in Vienna thirty years ago Dr L. C. Taylor of Springfield, Illinois. This old veteran is a good soldier. He has been telling my assistants of the part that he and his company took in the battle of Nashville and how they captured eight guns from the enemy. I have explained to him the fact that because of his condition it would be necessary to operate on him under a local anesthetic, and he has agreed to the proposition. Dr Taylor had him under observation for some time and made a diagnosis of carcinoma at the pyloric end of the stomach with a fairly complete obstruction. He has lost a good deal of weight and is very weak from starvation. The x-ray plates show a filling defect at the pyloric end of the stomach. With the obstruction and the absence of free hydrochloric acid there is little doubt as to the diagnosis. What I contemplate doing is an exploratory operation, and we shall decide after we open the abdomen whether to make the operation purely exploratory or whether to do the palliative operation of gastro-enterostomy or resection.

I infiltrate with the same novocain solution the abdominal wall in the midline from the ensiform to an inch or two below the umbilicus going to the left side of the umbilicus (Fig. 393). I then divide through the skin and superficial fascia of the linea alba. Coming down to the peritoneum I now infiltrate this thoroughly with novocain solution. Dividing the peritoneum the full extent of the incision, I now very gently draw the stomach up into view. Pulling on the stomach is a little distressing to the patient, but he does not complain of the procedure. I infiltrate the hepatic omentum and the great omentum extending from the stomach down to the transverse colon and the peritoneum around the duodenum with local anesthetic (Fig. 394). Bringing the stomach, which is fairly movable, out of the abdominal cavity

you see that he has at the pyloric end of the stomach a carcinoma about as big as an egg, although of course irregular in outline. The glands are not extensively involved. There is, however, one

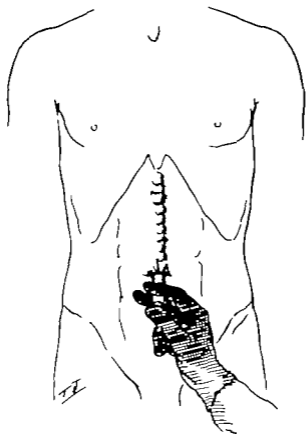


Fig. 393.—Subcutaneous injection of line of incision, which extended from xiphoid to umbilicus.

good-sized gland which is palpable over the greater curvature of the stomach and just to the left of the pylorus. There is no evidence of any other glandular involvement or of any metastatic masses either in the liver or elsewhere in the abdominal

cavity. On that account I intend to resect the stomach and shall do a typical Billroth second operation (Fig. 395).

Beginning near the greater curvature with a series of ligatures, I ligate the vessels between the stomach and the trans-

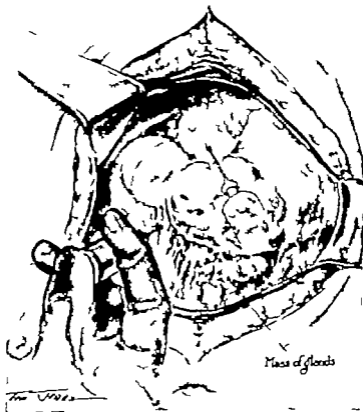


Fig. 394 — Incision of gastrohepatic and gastrosplenic omentum before freeing tumor. Note mass of glands along greater curvature.

verse colon. This opens of course the lesser peritoneal cavity. I then ligate off the gastrohepatic omentum in the same way, mobilizing completely the carcinoma. I then very carefully free the first 2 inches of the duodenum. I now crush the duodenum

just distal to the pylorus with a very heavy crushing forceps and ligate it off with heavy silk ligature. I now take the electric cautery and cut off the duodenum just proximal to the ligature after clamping the pyloric end of the stomach so as to prevent the escape of any stomach contents. The handling of the duodenum is the most important part of a stomach resection. It is

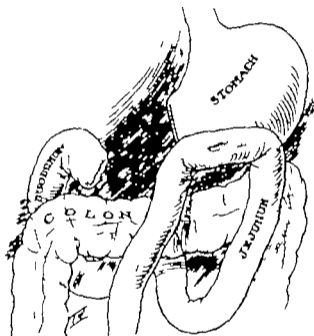


Fig. 295.—Diagram showing Billroth II method of closure. It is anterior gastro-enterostomy.

very important to make the duodenal closure so as to prevent any leakage. I now put a purse-string suture about $\frac{1}{4}$ inch from my silk ligature on the duodenum and invaginate the stump carefully. I then tie the purse-string suture. This purse-string suture is of linen. I now put a second purse-string suture also of linen over the first. The second one, however, is placed about $\frac{1}{2}$ inch further down on the duodenum. I now put on a stom

ach clamp protected with rubber tubing to the left of the carcinoma on the stomach, and again with the electric cautery I divide the stomach about $\frac{1}{2}$ inch from the clamp after having, as you see put on another stomach clamp so as to prevent the escape of any of the stomach contents. I shall now close the end of the stomach with three rows of sutures the first one is simply through the mucosa, the second through the peritoneum and muscularis and the third is a typical Lembert. We have now removed the carcinoma and have closed the duodenum and the end of the stomach. Our next problem is to unite the jejunum to the stomach. We could do this either as a posterior gastro-enterostomy or as an anterior gastro-enterostomy. I think on the whole the anterior gastro-enterostomy in this case is to be preferred. I shall then take a loop of the jejunum about 15 inches from its beginning and bring this in front of the transverse colon, and make an anastomosis between this loop and the anterior surface of the stomach. My own impression is, there is very little difference in the result whether we make an anterior or posterior gastro-enterostomy in these stomach resections. As I understand, Balfour in the Mayo Clinic, has rather favored in their recent cases the anterior position of the gastro-enterostomy. My own assistant, Dr. Gatewood, feels rather strongly that the posterior operation is the operation of choice, and thinks that the cases in which we have done the posterior operation have done better than those in which we have done the anterior.

The patient as you see, has stood the operation very well. Indeed and (as you heard him) in a fairly loud voice he is able to thank us for what we have done for him.

After-history—The patient made a very good operative recovery as far as the wound was concerned but he had a rather hard time of it for a number of days because of what seemed like a partial gastric ileus or expressed in another way a moderately acute dilatation of the stomach. This however was controlled by washing out twice a day morning and evening. In spite of this he vomited for a number of days. This evidently was not due to any mechanical obstruction due to failure of our surgical

technic, but I think quite definitely due to a paralyzed condition of the stomach. He had had the obstruction so long that the stomach was like an old paralyzed bladder which has been distended for a long time because of prostatic hypertrophy and it takes a long time to regain its muscular power. At the end of about two weeks he began to pick up rapidly. The stomach regained its power of expulsion and he began to eat semisolid food and went on and made a very satisfactory and complete recovery.

This case again demonstrates the possibilities of local anesthesia in very extensive abdominal operations such as resection of the stomach. I have resected more than half of the large intestine under local anesthesia. We did that in a case in which the patient had a carcinoma of the bowel and also a carcinoma of the larynx. The carcinoma of the bowel was the imperative condition demanding relief because of marked obstruction. Because of the carcinoma of the larynx we felt compelled to do the operation under local. Here again I want to say that where the condition of the patient warrants I much prefer to do a stomach resection under ether than under local or under nitrous oxid and oxygen, but there are certain cases in which because of the age and weakness of the patient and the starved condition, very often the acidosis of starvation being present, there is no choice. One cannot operate on some of these cases safely with ether and one is compelled to do the operation under local anesthesia, as we have done this morning. I feel that more and more in the future we shall extend the field of local anesthesia in abdominal work and, for that matter in almost all the surgical fields. I do not, however regard local anesthesia as ideal. I do not feel that it will ever displace general anesthetics, which have the virtue of rendering the patient unconscious and oblivious to what is being done during a serious surgical operation. There is a definite place too for the mixed procedure in which the abdominal incision is made under local, in which some of the painful steps of the procedure are made under nitrous oxid and oxygen, and in which the operation is then completed under local anesthesia. The position, however to my mind remains

unchanged and ether remains the anesthetic of choice. In those cases, such as the 1000 appendectomies which I have just referred to in my own series in which ether was used without a single death where there is no special reason for employing a local anesthetic or gas and oxygen or where there is no definite contraindication to a general anesthetic, I would employ ether

TWO CASES OF MEDIASTINAL TUMOR WHICH PROVED TO BE SUBSTERNAL THYROID ENLARGEMENTS

Synopsis Two patients presenting the clinical signs and symptoms of mediastinal tumor. History and physical findings. Operation—both cases proved to be substernal thyroid enlargements. After-history.

I HAVE within the last year had two very unusual cases on my service cases in which the clinical diagnosis was that of mediastinal tumor and in which operation proved that the tumors were substernal thyroid enlargements. These cases have been so instructive to me both from the standpoint of diagnosis and surgical therapy that I have thought it worth while to report them.

Case I.—A man of fifty five was referred to me from a neighboring state by his brother who was a medical colleague of mine. The patient had noticed for some months increasing difficulty in breathing, especially upon exertion. A little later his voice became husky and at times would be almost lost. He then noticed great distention of the veins of the upper part of the chest and the neck. The veins became hugely distended especially on exertion, and the chest and neck became enormously swollen. His face became cyanotic. It was quite evident that he had pressure upon the great veins in the mediastinum and on the recurrent laryngeal nerve and probably also upon the trachea and bronchi.

On physical examination by percussion the upper part of the chest was dull for an area larger than my fist in the midline beginning with the tip of the sternum. In the greatly swollen neck on the right side could be palpated by deep palpation a moderately enlarged right thyroid lobe. The x ray showed a tumor in the mediastinum larger than my fist. There was no history of a specific lesion, the Wassermann reaction was negative and there were no physical findings of aneurysm. The aneurysm was ruled out as a probability but not entirely as a

possibility in the case. The clinical diagnosis was that the tumor in the mediastinum was an enormous substernal thyroid enlargement, probably with an enlarged right lobe of the thyroid which could be palpated.

The symptoms of pressure had grown steadily worse week by week, and operation for relief was evidently absolutely indicated even though it carried with it considerable risk. I made up my mind to attempt to see what could be done under local anesthesia from above, and that if it could not be removed by opening the mediastinum through the neck incision I would either at that time or later divide the upper half of the sternum by a vertical incision and saw through the sternum about 3 inches below its upper end, separate the two halves of the sternum with some powerful separator like we are using in work on the chest for separating the ribs, and attempt to obtain an exposure that would enable me to remove the mass if it were possible to accomplish this. I felt that if the mediastinal mass was benign in order to save the patient's life it would be necessary to remove it. The patient was a very level-headed, intelligent man whom I knew would co-operate with me in every possible way in the undertaking.

Under local anesthesia I made an incision along the inner border of the sternocleidomastoid from the angle of the jaw down to the sternum. I divided the sternal insertion of the sternocleidomastoid, divided the deep cervical fascia and exposed the anterior belly of the omohyoid, and divided this so as to gain a wider exposure. This enabled me to bring into view the moderately enlarged right lobe of the thyroid gland. Retracting the edges of the incision so as to open it widely I introduced the index finger of the right hand into the mediastinum following the surface of the thyroid gland. Without any difficulty I could at once convince myself of the fact that the moderately enlarged thyroid gland which we palpated in the neck extended into the huge tumor in the mediastinum which we could see in the x-ray picture. With the gloved finger I attempted to find a line of cleavage between the tumor and the other structures in the mediastinum. I could do this for a dis-

tance of about 3 inches below the sternum, but I could not bring the mass out of the chest as one ordinarily can even in a good

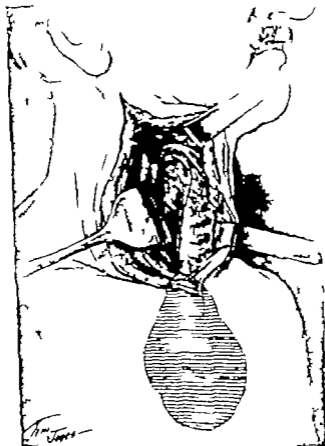


Fig. 396.—Mediastinal thyroid. Note incision parallel to sternocleidomastoid muscle. The omohyoid has been divided. The recurrent laryngeal is clearly seen. No evidence of the thyroid gland (shaded area) visible except when patient swallowed.

sized substernal goiter. I then thought of another procedure that might enable me to bring the tumor out of the chest cavity. I ligated separately the thyroid vessels and very carefully sepa-

rated the thyroid lobe in the neck from the surrounding structures, isolated the isthmus of the thyroid and divided it so that I could free the entire right lobe, at least that part of it that was in the neck, from the surrounding tissues, ligating at the same time the inferior thyroid vessels and hugging the posterior surface of the thyroid closely so as to avoid injury to the recurrent laryngeal nerve. When I completed this I could use that portion of the thyroid gland in the neck as a handle, and I grasped it in some large sponge forceps and attempted by making upward traction with one hand and making a blunt dissection with my gloved finger around the tumor in the mediastinum to dislocate the mediastinal tumor and bring it into view. I found however that I was unable to do this. I felt at this time if I had had a very small hand I could have introduced it into the mediastinum through the small circle that was formed at the upper part of the chest by the first rib and the sternum, and that I would have been able to have freed the tumor by blunt dissection from the surrounding tissues and brought it out of the chest. I recognized the fact, too, that if I had split the upper half of the sternum and increased to a sufficient extent the diameter of the upper opening of the thorax, I would have been able to have removed the tumor. Because of my tugging at this time the patient was uncomfortable and although he co-operated with me in every way I felt that it was not wise to divide the sternum and I thought of another possible procedure *that of removing the mass by morcellement*.

Using several sponge forceps, I grasped the upper end of the tumor pulled it upward and outward, and then grasped the mass a little lower with a second pair of forceps. I then removed the thyroid tissue piecemeal, somewhat in the same way as we have done, following the example of the French surgeons removing fibroid tumor of the uterus by morcellement through the vaginal route, and in this way we succeeded in removing a very considerable part of the substernal thyroid mass but I was certain that I had not by any means removed all of it. Finally I had considerable hemorrhage which required packing to control, and I determined to desist from any further operati pro-

cedure at that time. I therefore packed in some iodoform gauze which very readily controlled the bleeding closed the upper part of the incision, but left the lower part open for the iodoform gauze.

Fortunately the patient made a very excellent operative recovery. The removal of a considerable mass of thyroid tissue from the mediastinum relieved him very greatly of the pressure symptoms. The venous engorgement within a few days was distinctly less and breathing was freer and less arduous, and within a short time the evidence of pressure on the recurrent laryngeal nerve was distinctly diminished. He remained under my observation at the hospital for several weeks, and left the hospital with a suppurating sinus which I thought would probably close within a short time so I allowed him to return to his home in Ohio to report to his attending physician. The attending physician kept me posted as to the future outcome of the case which was interesting and very satisfactory. After a rather long period of profuse suppuration he finally passed a sloughing mass, probably a considerable part of the thyroid, and the fistula then closed and he was practically entirely relieved of his pressure symptoms. During this period I did two things which I thought might have some value in diminishing the amount of thyroid tissue which I had left in the chest. There had been no toxic symptoms, so I did not hesitate to put him on moderate doses of thyroid extract. We also gave him some x ray exposures, with the thought that these might prove of benefit. The final outcome was very satisfactory to the patient in the sense that he is cured of the condition, and x ray examination shows the entire disappearance of the substernal mass.

Case II.—This case is one which I have recently had under observation and one which had been studied by several of my colleagues, Dr Shippey, Dr Herrick and Dr Abbott, at the Presbyterian Hospital.

The patient was a man about fifty years of age who had within seven or eight weeks developed very marked pressure symptoms in the mediastinum, loss of the voice, pressure upon the veins and upon the trachea and bronchi, and great difficulty

in breathing, and marked dilatation of the superficial veins of the upper part of the chest and neck. My colleagues had studied very carefully the physical findings and found an area of dulness in the upper half of the mediastinum. They found that the esophagus was normal. There was no definite evidence of aneurysm, no history of a specific lesion, and the Wassermann was negative. The most interesting bit of evidence they succeeded in obtaining was that in making a fluoroscopic examination of the chest they could see a tumor about as large as a good-sized Bartlett pear which moved up and down in the chest with swallowing. The tumor was apparently somewhat to the right of the midline. Careful examination of the neck revealed no palpable thyroid gland, and as a matter of fact, one could not palpate any thyroid gland tissue at all.

My medical colleagues had discussed a number of possibilities—mediastinal tumor, subternal thyroid and the vague possibility of aneurysm—which however they pretty definitely excluded. When they called me into consultation and presented the evidence which they had obtained I suggested an exploratory operation exposing the mediastinum from above under local anesthesia. The recommendation was submitted to the patient, who was eager to have an effort made to relieve him of the increasing obstructive symptoms. Without any preliminary morphin I made an incision along the anterior border of the sternocleidomastoid (Fig 397) as in the previous case, and after dividing the omohyoid and the deep cervical fascia I could freely expose the thyroid cartilage and the trachea, and in the ordinary position of the right lobe of the thyroid gland there was no thyroid gland at all. I then continued my dissection until I could expose the upper part of the mediastinum, following the trachea and esophagus downward. I then retracted the edges of the incision widely and then asked the patient to swallow and as he did this coming up from the mediastinum was what appeared like a large lymphatic gland about as big as the end of my finger. This would come up as he attempted to swallow and then, as he finished the effort of deglutition, it would pass back out of sight into the chest. I asked him to do

this again, and as the small projecting mass came upward I grasped it in a pair of forceps, and on making gentle traction I

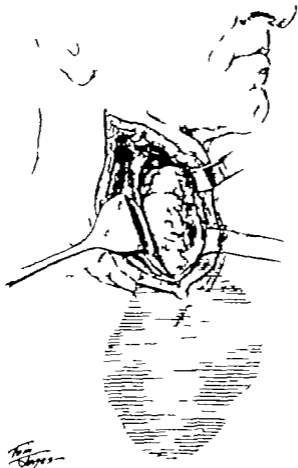


Fig. 397.—Note incision parallel to anterior border of sternocleidomastoid muscle before medial portion of thyroid (shaded area) has been displaced. Upper portion of gland seen in its normal position.

found that I could pull into view and entirely out of the chest the mediastinal thyroid mass about 4 inches in length and